This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

Astr. 6279. 02

Bound
JUN 11 1903

Harvard College Library
FROM THE
UNITED STATES GOVERNMENT
THROUGH
The Coast and Geodetic Survey

SCIENCE CENTER LIBRARY

UNITED STATES COAST AND GEODETIC SURVEY OFFICE.

TREASURY DEPARTMENT
U. S. COAST AND GEODETIC SURVEY
O. H. TITTMANN
SUPERINTENDENT

UNITED STATES

MAGNETIC DECLINATION TABLES AND ISOGONIC CHARTS

FOR

1902

AND

Principal Facts Relating to the Earth's Magnetism

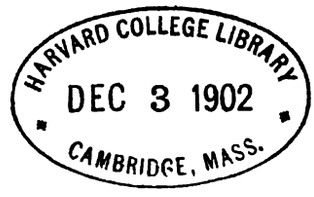
BY

L. A. BAUER
Chief of Division of Terrestrial Magnetism

WASHINGTON
GOVERNMENT PRINTING OFFICE
1902

AsTr 62[illegible]2

1902
26



CONTENTS.

	Page.
PREFACE	7
DEFINITIONS	9
PRINCIPAL FACTS RELATING TO THE EARTH'S MAGNETISM.	
Early History of the Compass.	
Discovery of the Lodestone	11
Discovery of Polarity of Lodestone	12
Introduction of the Compass	15
Improvement of the Compass by Petrius Peregrinus	16
Improvement of the Compass by Flavio Gioja	20
Derivation of the word Compass	21
Voyages of Discovery	21
Compass Charts	21
Birth of the Science of Terrestrial Magnetism.	
Discovery of the Magnetic Declination at Sea	22
Discovery of the Magnetic Declination on Land	25
Early Methods for Determining the Magnetic Declination and the Earliest Values on Land	26
Discovery of the Magnetic Inclination	30
The Earth, a Great Magnet.	
Gilbert's "De Magnete"	34
The Variations of the Earth's Magnetism.	
Discovery of Secular Change of Magnetic Declination	38
Characteristics of the Secular Change	40
Diurnal Variation	47
Annual Variation	52
Minor Periodic Fluctuations	53
Magnetic Storms	53
Magnetic Observatories	56
Magnetic Charts.	
Isogonic Lines	62
Magnetic Meridians	63
Magnetic Surveys.	
General Remarks	65
Historical Summary	67
Magnetic Survey of the United States	70
The Earth's Magnetic Poles and Magnetic Moment.	
Magnetic Poles	73
Magnetic Moment	76
DETERMINATION OF THE TRUE MERIDIAN AND THE MAGNETIC DECLINATION.	
Determination of the True Meridian.	
By Observations on Polaris	79
By Observations on the Sun	90
Determination of the Magnetic Declination.	
With an Ordinary Compass or Transit	94
With a Magnetometer	94

Page.

THE SECULAR CHANGE OF THE MAGNETIC DECLINATION IN THE UNITED STATES AND OUTLYING TERRITORIES.
General Characteristics of the Secular Change in the United States 99
Secular Change Tables.
Explanatory Remarks..... 100
Tables 102
THE MAGNETIC DECLINATION IN THE UNITED STATES AND OUTLYING TERRITORIES FOR JANUARY 1, 1902.
Introduction..... 117
Explanatory Remarks to Declination Tables..... 117
Chart of the Lines of Equal Magnetic Declination in the United States for 1902.
Previous Isogonic Charts by the Coast and Geodetic Survey 118
Isogonic Chart of the United States for 1902 119
Secular Motion of the Agonic Line in the United States 122
Isogonic Chart of Alaska for 1902..... 122
Local Disturbances of Compass in Alaska..... 123
Isogonic Charts of the Other Outlying Territories..... 123
TABLE OF THE MOST RECENT MAGNETIC DECLINATIONS OBSERVED IN THE UNITED STATES AND OUTLYING TERRITORIES, REDUCED TO JANUARY 1, 1902..... 124
DESCRIPTIONS OF MAGNETIC STATIONS OCCUPIED BY THE COAST AND GEODETIC SURVEY BETWEEN 1881 AND JUNE 30, 1902..... 267

ILLUSTRATIONS.

FIGURES.

		Page.
1.	A Japanese South-pointing Cart (seventh century A. D.)	13
2.	Floating Compass used by Peregrinus (1269)	19
3.	Double Pivoted Compass invented by Peregrinus (1269)	19
4.	Lines of Equal Magnetic Declination for 1500 (van Bemmelen)	23
5.	Compass Sun-dial showing Earliest Magnetic Declination at Paris (1541)	25
6.	First Dip Circle (Norman's, 1576)	32
7.	Norman's Experiment showing Action of the Earth on a Magnetic Needle	33
8.	Comparison of the Secular Change Curves of the Magnetic Declination at various Stations in the Northern Hemisphere	44
9.	Curves showing Secular Change in Magnetic Declination and Dip at London, Boston, and Baltimore	45
10.	Comparison of Curve showing Change in Magnetic Declination and Dip along Parallel of Latitude 40° North in 1885, with Curve showing Secular Change at Rome	46
11.	Diagram showing Diurnal Variation of the Magnetic Declination at Baldwin, Kansas., 1901	48
12.	Coast and Geodetic Survey Magnetic Observatory at Cheltenham, Maryland	57
13.	Eschenhagen Magnetograph at Coast and Geodetic Survey Magnetic Observatory, Baldwin, Kansas	59
14.	Magnetograms showing Guatemala Earthquake Disturbance at Cheltenham Magnetic Observatory, April 18, 1902	60
15.	Magnetic Disturbance at Cheltenham Magnetic Observatory, April 10–11, 1902	61
16.	Magnetic Disturbance at Cheltenham Magnetic Observatory at time of Martinique Volcanic Eruption, May 8, 1902	61
17.	Lines of Equal Magnetic Declination for 1600 (Hansteen)	62
18.	" " " " " " 1700 (Halley)	62
19.	" " " " " " 1800 (Hansteen)	62
20.	" " " " " " 1858 (British Admiralty)	62
21.	" " " " " " 1905 (" ")	64
22.	" " " " Dip " 1905 (" ")	64
23.	Magnetic Meridians for 1836 (Duperrey)	64
24.	Lines of Equal Magnetic Declination in the Polar Regions for 1885 (Neumayer)	64
25.	Mean Secular Change of the Magnetic Declination, 1890–1900 (Neumayer)	66
26.	Map of Region around North Magnetic Pole (Schott, 1890)	75
27.	Diagram of principal Stars in the Constellations Cassiopeia and Great Bear	84
28.	Coast and Geodetic Survey Magnetometer	95
29.	Map showing Positions of the Agonic Line between 1700 and 1900 (Schott)	123

PLATES.

Frontispiece.—United States Coast and Geodetic Survey Office.

I. Lines of Equal Magnetic Declination and of Equal Annual Change in the United States for 1902.

II. Lines of Equal Magnetic Declination in Alaska for 1902.

PREFACE.

The "United States Magnetic Declination Tables for 1902" is a continuation of the series of papers, begun in 1855, treating of the magnetic declination in the United States, and published, with the authority of law, by the Coast and Geodetic Survey.

The previous papers contained the magnetic declination tables and accompanying charts of lines of equal magnetic declination (isogonic charts) for the following epochs, successively: 1850 (first edition), 1850 (second edition), 1860, 1870, 1875, 1885, 1890, and 1900, the last published in 1897. The accumulation of much additional material since the date of the last publication and the constantly increasing demand for magnetic data have made it imperative to bring the tables up to date.

Owing to the large number of stations that it has been possible to occupy annually since July 1, 1899, when the facilities and means for magnetic work were enlarged, the present paper can, if necessary, be followed by another in a few years bringing the results up to 1905. Thereafter it is proposed to issue the publication at suitable intervals. In addition it is the intention to publish the results obtained by the magnetic parties of the Coast and Geodetic Survey during each year in the "Annual Report of the Superintendent."

In order to meet the demand for general information regarding the Earth's magnetic phenomena, the present tables have been prefaced by a historical and descriptive summary, accompanied by numerous and pertinent illustrations, of the principal facts of the Earth's magnetism. It is believed that this will be a welcome addition, especially at this time, when such marked attention is being paid, at home and abroad, to the study of the remarkable facts concerning the physical history of our planet, as revealed by the magnetic needle. One of the greatest students of magnetism of all times, Clerk Maxwell, says:

"The field of investigation into which we are introduced by the study of terrestial magnetism is as profound as it is extensive. We know that the Sun and the Moon act on the Earth's magnetism. It has been proven that this action can not be explained by supposing these bodies to be magnets. The action is therefore indirect. In the case of the Sun, part of it may be thermal action, but in the case of the Moon, we can not attribute it to this cause. * * * What cause, whether exterior to the Earth or in its inner depths, produces such enormous changes in the Earth's magnetism that its magnetic poles move slowly from one part of the globe to another? When we consider that the intensity of the magnetization of the great globe of the Earth is quite comparable with that which we produce with much difficulty in our steel magnets, these immense changes in so large a body force us to conclude that we are not yet acquainted with one of the most powerful agents in nature, the scene of whose activity lies in those inner depths of the Earth, to the knowledge of which we have so few means of access."

A chapter has been added giving briefly methods for determining meridian lines and the magnetic declination, and in another are set forth the facts concerning the secular change of the magnetic declination in the United States and outlying territories, accompanied by the necessary tables of the amount of change for various periods.

The accompanying Chart of the "Lines of Equal Magnetic Declination in the United States" contains, in addition, the "Lines of Equal Annual Change," thus adding greatly to the convenience in the practical utilization of the Chart. With their aid the corrections to the "Lines of Equal Magnetic Declination" for any subsequent year prior to the next edition can readily be made. The Chart, as stated in its legend, is based on all known observations up to date, and refers to January 1, 1902. The base map contains sufficient physical features and names of towns to render it possible to locate readily on the map any desired place.

The "Magnetic Declination Tables," forming the main body of the publication, contain about 8000 entries, and are the most complete tabular presentation of declination values in the United States.

"Descriptions of the Coast and Geodetic Survey Magnetic Stations occupied between 1881 and June 30, 1902," conclude the publication. The descriptions of the stations previous to 1881 are contained in Appendix 9, Report for 1881.

An attempt has thus been made to give in one publication all the data and tables required by those who will have occasion to make use of it.

In conclusion, I take pleasure in acknowledging the able assistance rendered by Mr. D. L. Hazard, Computer of the Division of Terrestrial Magnetism, to whom was intrusted the preparation of the "Tables" (Secular Change and Magnetic Declination) and the "Descriptions of Stations," various persons assigned temporarily to the Division rendering him more or less aid. He has thoroughly revised and systematized the secular change tables, a piece of work requiring great care, nice discrimination, and good judgment.

DEFINITIONS.

To avoid the confusion arising from the use or misuse of the term "variation of the compass," the following terms are used instead throughout this publication:

Magnetic declination: The angle by which the compass needle points to the east or west of true north.

Secular change of the magnetic declination: The change in the magnetic declination with the lapse of years.

PRINCIPAL FACTS RELATING TO THE EARTH'S MAGNETISM.

EARLY HISTORY OF THE COMPASS.

Discovery of the Lodestone.

Many centuries before the Christian era writers referred to a mysterious "stone" possessing remarkable properties, chief of which was its power to "draw to it the all-conquering iron." Its earliest names appear to be Hercules stone (heraclein stone), magnet-stone, Lydian stone, siderit (iron stone), and also briefly "stone." Later the term "stone" and "Hercules stone" gave way to the name "magnet."

The precise derivation of the term "magnet," which has now become the most common one, is difficult to ascertain. Lucretius (99–55 B. C.) says it was called "magnet" from the place from which it was obtained—"in the native hills of the Magnesians." However, Pliny (23–79 A. D.) relates a prettier legend, as copied from the poet Nicander (second century B. C.), that the shepherd, "Magnes" by name, while guarding his flock on the slopes of Mount Ida, suddenly found the iron ferrule of his staff and the nails of his shoes clinging to a "stone," which became known after him as the "Magnes stone" or magnet.

The fundamental property of the lodestone of attracting iron was certainly known to the Greeks toward the close of the seventh century B. C., as it is mentioned by Thales, who lived between 640–546 B. C.

Magnetic mountains which caused ships to fall to pieces by drawing from their sides the iron nails, or, by disturbing the compass, caused to be dashed to pieces on the rocks the vessel that was unlucky enough to come within too close proximity to their influence, remained in the category of sea terrors until but a comparatively short time ago.

In writings of the middle ages we find used for the term magnet "adames," which also meant diamond; e. g., in the oriental history of the Cardinal Jaques de Vitry, of about the year 1218. The Italian term was "calamita;" the Dutch, "magnetsteen;" and "zehl-steen" (sailing stone); the Icelandic, "leider-steen" (lead stone), from which the English term of lodestone[a] is derived; the Hungarian, "magnet-ko" (magnet stone); the Polish, "magnes" and "magnet;" the Croatian, "zelezoolek" (which attracts iron); the Dalmatian, "zoosdotegh" (which draws nails); the French, "aimant" (loving stone); the Spanish, "piedramant;" and the German, "magness," "siegel-stein," and "magnetstein." The lodestone was also called by early English writers "adamant stone."

[a] Also spelled *loadstone*, the spelling used in this publication being the preferable one, however, as more clearly showing the derivation.

Klaproth remarks that nearly all of the European terms, as far as their signification is concerned, recur in the Asiatic tongues. Thus the most common expression of the Chinese was "thsee schy" (or loving stone), hence similar to that of the French. For example, the author Tschlin-thsangkhi says: "The magnet draws to it the iron as the tender mother calls her children to her, and for this reason it has received its name of the loving stone." Other Chinese terms for magnet were "tchu chi" (stone which deflects), "hie thy schy" (stone which unites with iron), etc.

The lodestone or natural magnet is known to the geologist as the mineral "magnetite" and is the magnetic or black oxide of iron, Fe_3O_4, this oxide being formed when iron is oxidized at a high temperature in the air, in oxygen or in aqueous vapor. It is quite widely distributed over the earth, some of the most notable specimens coming from Magnet Cove, Arkansas. Its general color is blackish or brown and occasionally grayish, and its specific gravity is 5.0 to 5.1.

Discovery of Polarity of Lodestone.

Not only does the lodestone or magnetite possess the property to "draw" to it iron objects, but it also has that of "polarity," i. e., it exhibits contrary effects at opposite ends, e. g., at one end it attracts the north end of a magnetic needle and at the other end repels it.

By virtue of this polarity and the fact that the "earth itself acts like a great magnet," a lodestone pointed at the ends and suspended so as to turn freely will set itself in an approximately north-and-south direction. This "directive" tendency of the lodestone or needle was termed by Gilbert in 1600 its "verticity."

It is this property of polarity which distinguishes a piece of nonmagnetized iron from a magnetized one, the former attracting either end of a compass needle, while the latter will either attract or repel, according as the unlike "poles" or the like "poles" of magnet and needle are brought together.

This property became known to European nations about the twelfth century. The Chinese are, however, generally credited with the earliest knowledge of the directive property of the lodestone and of its power to communicate polarity to iron. Tradition would even ascribe this knowledge to them as far back as the year 2634 before the Christian era. A quaint legend relates that in the sixty-fourth year of the reign of Ho-ang-ti (2634 B. C.), the Emperor, Hiuan-yuan, or Ho-ang-ti, attacked the rebel, Tchi-yeou, or Khiang, on the plains of Tchou-lou. Khiang getting the worst of the conflict, raised a great fog in order to throw the ranks of his adversary into confusion. Hiuan-yuan, however, was equal to the occasion and constructed a chariot (Tchi-nan), *which indicated the south*, so as to distinguish the four cardinal points, and thus was enabled to pursue Khiang and take him prisoner.[a]

Benjamin[b] considers this legend as "clearly mythical" and remarks that "while the beginning of Chinese history is placed by De Lacouperie at the twenty-third century B. C., other Chinese annalists regard it as impossible to rely upon any records

[a] Klaproth, Lettre à M. le Baron Humboldt sur l'invention de la Boussole, Paris, 1834. Also Mailla, Histoire génerále de la Chine, tome I, p. 316, Paris, 1777.

[b] Intellectual Rise in Electricity, London, 1895; republished by Wiley & Sons, New York, in 1898, under the title of "History of Electricity." The writer has made considerable use of this work.

dating back more than 800 years before our era. Legge fixes the beginning of trustworthy chronology at 826 B. C., and Plath at 841 B. C. It is apparent, therefore, that in dealing with the legends and traditions which form the basis for the assertion of knowledge of the magnet by the Chinese at very ancient epochs, the doubt whether they properly belong to mythology or to history is unavoidable."

In Japan these south-pointing carts were known in the second half of the seventh century A. D. Figure 1 is a reproduction of a picture contained in Vol. XXIII of the large Japanese encyclopedia and taken from Urbanitzky's book Electricität im Alterthume, to which the writer is indebted for various references.

Several other references to the compass have been cited as appearing in early Chinese records. The first direct statement as to their knowledge of the property of *polarity* is said to have occurred in a Chinese dictionary completed about 121 A. D., a period when at least the *attractive* properties of the lodestone had been known to European nations for six centuries and more. According to Benjamin, "this statement consists of but six Chinese characters in the dictionary Choue-Wen, where the character 'Tseu' is defined as 'the name of a stone with which the needle is directed.' Even this is known only by citations in later works."

FIG. 1.—A Japanese south-pointing cart (7th century A. D.).

Whatever doubt may be raised regarding these early Chinese references, the fact is that the lodestone, or magnetite, is known to have existed in the iron deposits extensively worked in Shensi in 220 B. C., so that the Chinese had ample opportunities for becoming familiar with the properties of the lodestone.

The first reference to the use of the compass for navigational purposes is found in the Chinese encyclopedia, Poei-wen-yun-fou. It is said that under the Tsin dynasty, or between 265 and 419 A. D., "there were ships indicating the south."

The most remarkable passage, however, occurring in the early Chinese literature is one toward the end of the eleventh century of the Christian era in a work entitled "Mung-Khi-pi-than," viz:[a]

"The soothsayers rub a needle with a magnet stone, so that it may mark the south; however it declines constantly a little to the east. It does not indicate the south exactly. When this needle floats on the water it is much agitated. If the finger-nails touch the upper edge of the basin in which it floats they agitate it strongly; only it continues to slide, and falls easily. It is better in order to show its virtues in the best way to suspend it as follows: Take a single filament from a piece of new cotton and attach it exactly to the middle of the needle by a bit of wax as large as a mustard seed. Hang it up in a place where there is no wind. Then the needle constantly shows the south; but among such needles there are some which, being rubbed, indicate the north. Our soothsayers have some which show south and some which show north. Of this

[a] Ed. Biot: Comptes rendus, t. XIX, p. 825. The passage is quoted from Benjamin's book.

property of the magnet to indicate the south, like that of the cypress to show the west, no one can tell the origin."

According to Klaproth, the same fact is related in a natural history compiled by Kew-tsung-schy, in the years 1111–1117, under the title of Pen-thsao-yan-i, and it is stated that the "south end of the needle always shows a deviation toward the point 'ping,' *i. e.*, E. $\frac{1}{8}$ S.," hence $\frac{1}{6}$ of 90° or 15° east of south, so that the north end pointed 15° west of north.

Benjamin says "that the tendency of the magnetic needle to depart from the true north appears to have been observed by the Chinese geomancers in the compasses used by them long before any marine use of the instrument was made. A so-called life of Yi-hing, a Buddhist priest and imperial astronomer, undertakes to show that the 'variation' in the eighth century was nearly 3° west of south. Later we find the geomancers adding special circles of symbols to the compass card, such as a circle of nine fictitious stars, a circle of sixty dragons, and so on, and, among these, circles of points especially constructed to allow for 'variation'. This was done in the year 900 by Yang Yi when the variation was 5° 15′ east of south, and again three centuries later when it had increased to 7° 30′[a] in the same direction."

The Chinese apparently would have to be credited by these passages with a far superior knowledge of the properties of the magnet than possessed at that period by the European nations. They not only seemed to know of the magnetic declination of the needle, by reason of which the needle did not point true north and south, but also anticipated Europeans by several centuries in the most delicate method of suspension of a needle by means of a fiber. The Jesuit Lana, according to Hansteen, is said to have introduced the fiber suspension in Europe about 1686. According to Prof. Sylvanus P. Thompson, however, the suspending of a magnetic needle by a thread occurs in the Speculum Lapidum of Camillus Leonardus, published at Venice in 1502.

Klaproth, who made a special study of the early history of the compass, found "no indubitable use" of the compass by the Chinese in *navigation* until toward the end of the thirteenth century, at which time it had been on European ships for a century or more. All efforts to satisfactorily account for the spread of the knowledge of the properties of the lodestone from Eastern to Western nations, or vice versa, have thus far failed.[b]

Summing up all the evidence, it would seem that the prime properties of the lodestone—attraction, polarity, directivity—were doubtless discovered independently by the Chinese and by the occidental peoples and that the preponderance of evidence of priority at present would seem to be on the Chinese side.

The Chinese undoubtedly were the first to use the compass in land journeys and in the orientation of buildings and sites. It is related that, in the early part of the four-

[a] According to Klaproth, as cited above, this was 15°.

[b] The number of points of the compass, according to the Chinese, is twenty-four, which are reckoned from the south pole; the form also of the instrument they employ is different from that familiar to Europeans. The needle is peculiarly poised, with its point of suspension a little below its center of gravity, and is exceedingly sensitive; it is seldom more than an inch in length and is less than a line in thickness. It appears thus sufficiently evident that the Chinese are not indebted to Western nations for their knowledge of the use of the compass. (Encyclopædia Britannica, 9th ed., art. Compass.)

teenth century (1314–1320 A. D.), the temple of Yao-mu-ngan was oriented in this way. It is an interesting fact that they were guided by the south end of the needle, their name for compass being "ting-nan-ching," or needle pointing to the south. This was probably because in China the south is considered the honorable quarter, the Emperor taking his position facing south, and prominent buildings being placed facing south. To distinguish the south end of the needle from the north end it was painted red.

Introduction of the Compass.

The earliest definite mention as yet known of the use of the compass in the Middle Ages occurs in a treatise entitled "De Utensilibus," written toward the end of the twelfth century by an English monk, Alexander Neckam. He says:

"The sailors, moreover, as they sail over the sea, when in cloudy weather they can not longer profit by the light of the sun, or when the world is wrapped in the darkness of the shades of night, and they are ignorant to what part of the horizon the prow is directed, place the needle over the magnet, which is whirled round in a circle, until, when the motion ceases, the point of it (the needle) looks to the north."

Soon after the introduction of the compass, laws were framed against the falsifying of the compass. One of the most common beliefs which prevailed for many centuries was known as the "garlic myth" and mariners were charged not to eat onions or garlic lest the odor "deprive the stone of its virtue by weakening it and prevent them from perceiving their correct course."[a]

In the following extract from a poem entitled "Love's Complaint," found by M. Paulin Paris, a distinguished antiquarian, in a MS. of 1329 which he attributed to William the Clerk, a vassal of Sire Rauf or Raul, who fought in the wars of Frederick I in Italy (1159 to 1177) appears the following description of the compass used at that time:

Who would of his course be sure,
When the clouds the sky obscure,
He an iron needle must
In the cork wood firmly thrust.
Let the iron virtue lack
Rub it with the lodestone black,
In a cup with flowing brim,
Let the cork on water swim,
When at length the tremor ends,
Note the way the needle tends:
Though its place no eye can see—
There the polar star will be.

Furthermore, in the preceding verse he appears to assign the cause for the north and south pointing of the needle to the attractive influence of the polar star, a belief current until Gilbert's time (1600).

[a] One of these laws was as follows: "Whoever, being moved by sedition, shall menace the master or pilot of a ship with the sword, or shall presume to interfere with the nautical gnomon or compass, and especially, shall falsify the part of the lodestone upon which the guidance of all may depend, or shall commit like abominable crimes in the ship or elsewhere, shall, if his life be spared, be punished by having the hand which he most uses fastened, by a dagger or knife thrust through it, to the mast or principal timber of the ship, to be withdrawn only by tearing it free." (Benjamin's Intellectual Rise in Electricity.)

Allusions to the compass among the early writers now began to multiply, e. g., Guyot de Provins, in a poem written 1203–1208, Cardinal de Vitry (1218), and others. In a poem by Guido Guinicelli, an Italian priest who died in 1276, the following suggestive lines occur:

> In what strange regions 'neath the polar star
> May the great hills of massy lodestone rise,
> Virtue imparting to the ambient air
> To draw the stubborn iron; while afar
> From that same stone the hidden virtue flies
> To turn the quivering needle to the Bear,
> In splendor blazing in the Northern skies.

Matthew Paris, in relating the sending of the first papal legate to Scotland in 1247, says he "drew the money out of the Scots to himself as strongly as the adamant does iron."

In the middle of the thirteenth century the compass was in regular use among the Norwegians.

Bacon appears to have had his attention directed to the lodestone, which he calls "the miracle of nature," by Glanvil's encyclopedic work, written about 1250. He says "that the iron which is touched by the lodestone follows the part of the latter which excites it, and flies up from the other part, and that it turns to the part of the heavens to which the part of the magnet wherewith it was rubbed conforms." Furthermore, "that it is not the polar star which influences the magnet, for if such were the case the iron would always be attracted toward the star; on the contrary, the rubbed portion of the iron will follow the rubbed part of the magnet in any direction, backward or forward, or to the right or left," etc.[a]

Improvement of the Compass by Petrius Peregrinus.

We now turn to one of the most famous of the writings of the Middle Ages. Bacon in his "Opus tertium" says "there are but two perfect mathematicians, Master John of London and Master Petrius de Maharn, curia, a Picard." Peter stands especially high in his estimation. He was the author of the famous letter known as "Epistola Petri Peregrini de Maricourt ad Sygerum de Foucaucourt militem de Magnete."

This letter "on the magnet," written by the nobleman Pierre de Maricourt on August 12, 1269, to his friend and neighbor Syger de Foucaucourt, is probably the oldest European treatise on the magnet. The author's surname "de Maricourt" is derived from a little village in Picardy, France, from whence he came. He is, however, more generally referred to as "Petrius Peregrinus," the appellation of Peregrinus or Pilgrim indicating that he had taken part in the Crusades. He was a partisan of Charles of Anjou, who had been crowned King of the two Sicilies by Pope Urban IV, and who was laying siege for a second time to the town of Lucera, situated in the province of Apulia in southern Italy. Under the walls of this town Peregrinus wrote his memorable "epistola," which became known to many of the learned men of his time and succeeding centuries and had considerable influence on early writers on magnetism. It was reproduced in 1558 with an introduction and comments by Achilles Gasser, a

[a] If this quotation be correct as taken from Benjamin, then the latter part of Bacon's statement, "that the iron turns to the part of the heavens to which the part of the magnet wherewith it was rubbed conforms," is incorrect. The contrary, as we shall see later, is the case.

physician of Lindau, Germany, and again by subsequent authors, and more recently by Hellmann in his excellent series of Berlin reprints, "Neudrucke"—Rara Magnetica No. 10.[a]

Peregrinus was a man of learning, had the academic title of "magister," and, as stated, was regarded very highly by his contemporary, Roger Bacon. The deductions in his letter reveal in general a clear insight and sound reasoning powers. They are based usually on actual experiment, which doubtless accounts for the influence his little treatise exerted.

Some of the facts which Peregrinus cites in his letter had been previously known. However, he appears to have had the faculty of putting them in precise language. A summary of the contents of the letter will be found in Benjamin's book, from which the quotations below have been taken.

Peregrinus, in direct contradiction to the earlier writers, who invariably preferred the lodestone from India, gives preference to the one from northern Europe, which was used principally by sailors in the northern seas.

He explains how the poles of a magnet may be found, thus:

"The stone is to be made in globular form and polished in the same way as are crystals and other stones. Thus it is caused to conform in shape to the celestial sphere. Now place upon it a needle or elongated piece of iron, and draw a line in the direction of the length of the needle, dividing the stone in two. Then put the needle in another place on the stone, and draw another line in the same way. This may be repeated with the needle in other positions. All of the lines thus drawn will run together in two points, just as all the meridian circles of the world run together in two opposite poles of the world."

Peregrinus probably first found the poles in the way that is above described. Then, afterwards, he remarked that at the points so determined the needle was more strongly attracted than elsewhere. Consequently, he sees that the poles can be detected without marking the meridians by simply noting the places on the stones where the needle is most frequently and powerfully drawn. "If, however," he continues, "you wish to be precise, break the needle so as to get a short piece about two nails in length. Place this on the supposed polar point. If the needle stands perpendicularly to the surface of the stone such point is the true pole; if not, then move the needle about until the place is found where it does thus stand erect. If these points are accurately ascertained and the stone is homogeneous and well chosen," he adds, "they will be drawn diametrically opposite one another, like the poles of the sphere."

If the Earth's magnetism were uniformly distributed, Peregrinus's method of "converging magnetic meridians" could be applied to determine with greater accuracy, and certainly with more comfort, the position of the Earth's magnetic poles than by specially equipped expeditions to the arctic and antarctic regions. It would suffice to select a few well-chosen stations in easily accessible and climatically comfortable regions, to determine accurately the magnetic declination of the needle at these points, and to determine by an easy computation the points of intersection of the great circles passing through the compass directions at the selected stations. It will be seen,

[a] Sparing as Gilbert is in conceding the excellence of any work on magnetism prior to his own, the "De Magnete" of 1600, he characterizes Peregrinus's work "as a pretty erudite book, considering the time."

however, that owing to the great irregularity in the distribution of the Earth's magnetism this method is not admissible, and would give positions for the magnetic poles differing considerably from the actual positions.

Peregrinus next explains how to designate the two poles and to distinguish them from each other.

"Take," says Peregrinus, "a wooden vessel, round, like a dish or platter, and put the stone in it so that the two points of the stone may be equidistant from the edge; then put this in a larger vessel containing water, so that the stone may float like a sailor in a boat. The stone so placed will turn in its little vessel until the north pole of the stone will stand in the direction of the north pole of the heavens, and the south pole in that of the south pole of the heavens; and if it be removed from this position, it will return thereto by the will of God. Since the north and south parts of the heavens are known, so will they be known in the stone, because each part of the stone will turn itself to its corresponding part of the heavens."

Then, "If the north part of the stone, which you hold, be brought to the south part of the stone floating in the vessel, the floating stone will follow the stone you hold, as if wishing to adhere to it; and, if the south part of the held stone be brought to the north part of the floating stone, the same thing will happen. Know it, therefore, as a law," he says, "that *the north part of one stone attracts the south part of another stone, and the south the north.*"

We thus have a recognition of the well-known fact that unlike magnetic poles attract each other and while Peregrinus does not explicitly state the additional fact that like poles repel each other, it stands to reason that in the course of his experiments the fact of repulsion of like poles must likewise have manifested itself to him, especially, as it was known to his master, Bacon. However, it was customary for the early writers to speak simply of the "*attractive* virtue of the magnet."

It will be noticed that Peregrinus designated that part of the lodestone which points to the north as the north end or pole, and that part which is directed to the south, the south pole. He says, "You will infer what part of the iron is attracted to each part of the heavens from knowing that the part of the iron which has touched the southern part of the magnet is turned to the northern part of the sky. The contrary will happen with respect to that end of the iron which has touched the north part of the stone, namely, it will direct itself towards the south."

This is the first clear and accurate statement regarding the character of the poles induced in the "iron" by its "touch" with the "magnet" or lodestone, and the quarter of the heavens to which each pole will point, if the iron be freely suspended.[a] It will be noted that Bacon's statement (p. 16) is just the reverse of that of Peregrinus.

According to the laws of magnetism, the part of the iron touched by the magnet or lodestone will have induced in it a magnetic pole of an opposite kind to that in the end of the magnet used. Furthermore, since like poles repel and unlike ones attract each other, it is manifest that if the north end of a compass is called the *north* pole, the magnetism in the northern regions of the earth must be of the *south* pole kind, otherwise we should have repulsion instead of attraction. Or, if in the north end of the compass there resides magnetism of the *south* pole kind, then the earth's north magnetic

[a] Benjamin, thinking that Peregrinus had committed an error in his statement, offers various apologies for him.

pole has magnetism of the *north* pole kind. To avoid this confusion the north end of the compass is frequently referred to as "the north-seeking or north-pointing end," and the south end as the "south-seeking or south-pointing end." The part of the "iron," then, which touches the north-seeking end of the magnet will have magnetism of the south-seeking kind induced in it, and will point or be attracted to the south when the iron is delicately supported, and the part which is rubbed by the south-seeking end of the magnet has induced in it a pole of the north-seeking kind and hence will point to the north.

The chief achievement of Peregrinus was his improvement of the mariner's compass, which at that time was a very crude contrivance indeed, the magnet being supported by a reed floating in a vessel of water, and provided neither with an index to reckon from nor with a compass card. He combined the compass with the nautical astrolabe for measuring the sun's altitude, provided a fiducial line, or the so-called "lubber's point," and a graduated scale, thus enabling the mariner not only to steer his ship more truly, but likewise to determine the azimuth of a heavenly body. At first he floated his compass, but later introduced for the first time the pivoted or, rather, socketed compass, the description of which, as given by Benjamin, is as follows:

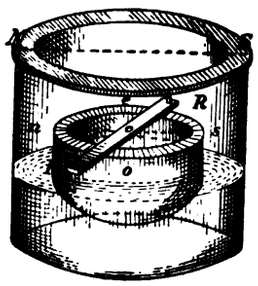


FIG. 2.—Floating compass used by Peregrinus (1269).

"The floating bowl and the large vessel of water are abolished, and in place of them there is the ordinary circular com-

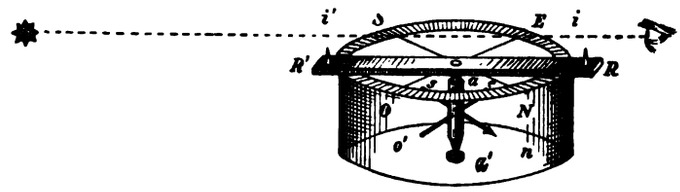


FIG. 3.—Double-pivoted compass invented by Peregrinus (1269).

pass box of to-day. Its edges are marked as those of the bowl were—with the degree of the circle. It is covered with a plate of glass. In the center of the instrument, and stepped in the glass cover and in the bottom of the box, is a pivot, through which passes the compass needle, now no longer an ovoid lodestone, but a true needle of steel or iron. Then at right angles to this needle is another needle, which, curiously enough, he says is to be made of silver or copper. Pivoted above the glass cover is an azimuth bar, as before, with sight pins at the ends. Now, he says, you are to magnetize the needle by means of the lodestone in the usual way, so that it will point north and south, and then the azimuth bar is to be turned on its center so as to be directed toward the sun or heavenly bodies, and in this way, of course, the azimuth is easily measured. In fact, the device is the azimuth compass of the present time. 'By means of this instrument,' says Peregrinus, 'you may direct your course toward cities and islands and all other parts of the world, either on land or at sea, provided you are acquainted with the longitudes and latitudes of those places.'"

Figure 2 represents the floating compass used by Peregrinus, and figure 3 his double-pivoted compass. Both figures have been directly reproduced from the memoirs on Peregrinus by Bertelli, who made the subject a special study.

It will be noticed that Peregrinus had in this compass all the devices necessary for ascertaining whether the magnetic needle pointed precisely to the north, or declined away from the north; however, he does not seem to have noticed any such departure. He would be especially interested in this, as he supposed that "from the poles of the world the poles of the magnet received their virtue." That he did not remark any declination indicates pretty strongly that the needle did not, at that time, point very far from north, so that if he did observe any departure, the smallness of the amount doubtless led him to ascribe it to imperfection of construction of his compass. A similar conclusion has been reached by the writer from other researches. At present the needle points about 9° west in southern Italy.

Peregrinus was credited by Thévenot in 1681 with having found a magnetic declination of 5° east in 1269, but Wenckebach's researches showed that this was an insertion in the Leyden manuscript of his "epistola" made in the early part of the sixteenth century, about which time the needle did actually point that amount at Rome. (See Table I.) Thévenot had likewise erroneously ascribed the authorship of this famous letter to "Peterus Adsigerus."

Recapitulating, Peregrinus may be accredited with very notable discoveries and achievements, chief of which are:

1. The mode of locating and distinguishing the magnetic poles of a magnet.

2. The method of touch and rubbing for reversing the polarity of a magnet and the fact that a magnet can be broken into any number of fragmentary pieces, each of which will be a magnet.

3. The first attempt at an azimuth compass, and the introduction of a mode of pivot suspension of the needle.

Improvement of the Compass by Flavio Gioja.

The contents of Peregrinus's letter did not become widely known, the few manuscript copies which had been made by the early monks lying buried in the monasteries until the sixteenth century, and so it happened that many of his discoveries were rediscovered.

In Peregrinus's pivoted compass the needle passed through a vertical shaft pivoted in the top and bottom of the compass, so that the shaft and needle turned together. In the modern compass, as is known, the compass needle turns on a fixed point. Furthermore, his compass lacked the modern subdivision of the circle into thirty-two points or the so-called "Rose of the Winds."

Flavio Gioja, who came from Positano in the hills back of Amalfi, Italy, is credited with the invention of the mariner's compass some time prior to 1318 (about 1302). Thus, Anthony of Bologna, in the latter part of the fourteenth century, writes that "Amalfi first gave to seamen the use of the magnet." It is considered probable that Gioja introduced the compass card of thirty-two points, or "Rose of the Winds," the mode of pivot suspension whereby the needle turns on a fixed point, and the attaching of the card to the compass needle, thus adding greatly to the usefulness of the compass at sea. The earliest maps having the "Rose of the Winds" are Genoese, of about the year 1318. During the summer of 1901 the invention of the mariner's compass by Gioja was celebrated at Amalfi by the Italians.

The character of the compass used in Mediterranean waters in the fourteenth century is seen from a statement of Da Buti's in 1380: "The navigators have a compass, in the middle of which is pivoted a wheel of light paper which turns on its pivot, and that on this wheel the needle is fixed and the star (Rose of the Winds) painted." The adoption of this compass by the English did not apparently take place for some time, as Chaucer does not mention until 1391 the division of the compass circle into 32 points instead of 24 points.

DERIVATION OF THE WORD "COMPASS."

The following quotation is from Prof. J. A. Fleming's lecture on "The Earth a Great Magnet," delivered at Bristol, England, in 1898:

"The word *compass* is an old English word, signifying a circle. 'My green bed embroidered with a compass' is mentioned in the will of Edward, Duke of York, who died in 1415.

"The well-known instrument for describing a circle is called a compass or pair of compasses. To encompass means to surround as by a circle, and most of you at some time or another have seen a public house with the sign of the 'Goat and the compasses,' which antiquarians tell us is only a corruption of the old pious house motto, 'God encompasses us.' Hence the magnetic instrument takes its familiar name from the circle of degrees or points which Peregrinus or Gioja added to enable it to indicate the angular distance of an object from the meridian."

VOYAGES OF DISCOVERY.

Under the initiative of Prince Henry of Portugal—Henry the Navigator—who founded a naval college, corrected charts, improved compasses, and made other advances in navigation, the compass played an important part in the great voyages of discovery of the fifteenth century. No important discovery relating to the compass resulted, however, until the memorable voyage of Columbus in 1492. Before passing to this mention should be made of the former compass charts toward the close of the fourteenth century and the first half of the fifteenth.

COMPASS CHARTS.

The early charts of the Mediterranean coasts of the fourteenth and fifteenth centuries were oriented by the compass and all bearings from one port to another were compass directions; hence these charts are known as "compass charts." It will be recalled that at their date the magnetic declination of the compass had not become known; it was believed that the compass pointed "true to the north pole," and that, hence, compass directions were also true directions. If a compass showed any marked departure from the true north this was accredited to mechanical imperfection in its construction.

The earliest of these charts were by Marino Sanuto, between 1306 and 1324. The best, however, are those in the atlas of Andrea Bianco of the year 1436 and this atlas has been subjected to a critical examination by Oscar Peschel.[a] He found that in spite

[a] Der Atlas des Andrea Bianco vom Jahre 1436, in zehn Tafeln. Photographische Facsimile in der Grösse des Originals, vollständig herausgegeben von Max Münster und mit einem Vorworte versehen von *Oscar Peschel.* Venedig, H. F. M. Münster, 1869.

of the crude appliances in use at that date the distances from place to place harmonized with later, more accurate determinations in a most remarkable manner, but the places were not always in their proper parallels of latitude, their departure therefrom varying in a perfectly systematic manner. Thus two places on the west Mediterranean coast were in the same parallel of latitude as places on the east Mediterranean coast, which as a matter of fact are situated in lower latitudes. In other words, the places had been plotted according to magnetic meridians and parallels. By measuring the angle for Rome, through which the chart[a] had to be turned in an ENW. direction, in order that the various places would fall in their proper *geographic* parallels, the writer found that *the magnetic declination at Rome was about 5° East in 1436 (or more likely before, since the charts were undoubtedly constructed from data obtained during many years prior to date of publication, 1436). This is the earliest information at present obtainable regarding the amount of the magnetic declination in Europe.*

BIRTH OF THE SCIENCE OF TERRESTRIAL MAGNETISM.

Discovery of the Magnetic Declination at Sea.

That the needle pointed "true to the pole" of the heavens or to the pole star had been, as we have seen, the general belief up to the close of the fifteenth century. It remained for the terrorized sailors on Columbus's first voyage to the New World to be made aware of the next great fact of the Earth's magnetism, viz, that the needle changes its direction from place to place and points exactly north and south over but a very limited region of the Earth.

It will be recalled that after leaving Palos Columbus set sail for Gomera, one of the Canary Islands, from whence he laid his course due west. Not many days out from Gomera, on September 13, 1492, to the great consternation of the sailors, it was noticed that "at the first of the evening of this day the needles varied to the NW., and the next morning about as much in the same direction. * * * September 17 the pilot took the sun's amplitude and found that the needle varied to the NW. a whole point of the compass. The seamen were terrified and dismayed, without saying why. The admiral discovered the cause and directed them to take the amplitude again next morning, when they found that the needles were true. The cause was that the star moved from its place, while the needles remained stationary."[b]

Before this time, as will be seen from Fig. 4, which gives the lines of equal magnetic declination for 1500, as recently drawn by van Bemmelen, the compass had pointed a few degrees east of north, but the amount, about 3° at Palos and at Gomera, was too small to attract special attention, and if it had it would have been attributed to an imperfection in the construction of the compass. The compasses used were doubtless divided into points (11¼°) and half points, allowing quarter points (about 3°) to be estimated. (In Fig. 4 the minus sign means east declination.)

After leaving Gomera the easterly declination of the compass, it will be seen, steadily diminished, until about September 13, when it was observed in the evening to

[a] Bianco's chart in E. Mayer's "Die Entwickelung der Seekarten, Wien, 1877" was used.

[b] Personal Narrative of the First Voyage of Columbus to America, translated by Samuel Kettell. Published by Thomas B. Wail & Son, Boston; G. C. Carvill, New York, and Carey & Lea, Philadelphia, 1827.

pass from east to west. According to Schott's computation,[a] the flagship of Columbus was at noon on September 13, 1492, in north latitude 28° 21′, and in longitude 29° 16′ west of Greenwich. This position is probably not far from the place through which the line of no magnetic declination—the so-called agonic line—along which the needle did stand "true to the pole," passed at that date. This line, as is seen from Fig. 4, lay a little to the west of Fayal Island of the Azores.

It will be noticed from the above extracts that on September 17 Columbus had gone far enough west of this line to have had the compass bear a whole point (11¼°) to the west. That the next morning "the needles were true again" is inexplicable, except that in order to allay the fears of his sailors he practiced some pardonable deception on them, and may possibly have changed the points of the compass, as he had done, according to his own confession, once before on another voyage, in order to force the inclination of a possibly mutinous crew to his will.

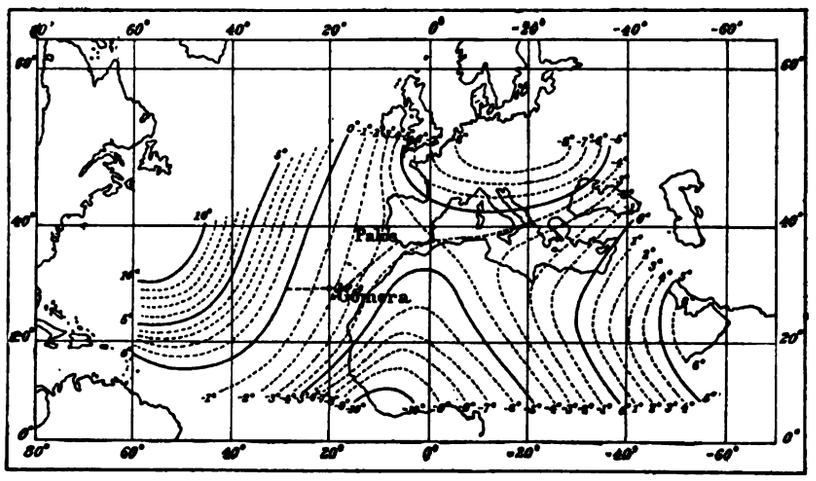


FIG. 4.—Lines of equal magnetic declination for 1500 (van Bemmelen).

The explanation which Columbus gave for the departure of the needles observed between September 13 and 17, that the North Star moved in its place, while the needles remained stationary, was, of course, a mere fiction to quiet the apprehensions of his crew. Columbus, according to the history written by his son, believed, as did Peregrinus and Bacon, that the needle was attracted or directed not by the Pole Star, but by all points of the heavens.

According to Schott's investigations, it would seem that toward the end of September, when about in midocean, the needle had reached its maximum westerly pointing; thereafter it continued to diminish, until at the first landing place of Columbus, which, according to the researches of Lieut. J. B. Murdock,[b] of the United States Navy, appears unquestionably to have occurred at Watlings Island, the needle bore but a trifle west.

[a] See Appendix No. 19, United States Coast and Geodetic Survey Report for 1880, p. 5, and Appendix No. 7, report for 1888, p. 305.

[b] "The Cruise of Columbus in the Bahamas, 1492." Proceedings of the U. S. Naval Institute No. 30, Annapolis, April, 1884.

Columbus himself does not mention the declination of the compass after September 17, nor does he say anything about the behavior of the compass on his return voyage, nor does he record anything regarding the compass on his second voyage (1493–1496), nor on the fourth (1502–1504). However, on the third voyage (from 1498 to 1500), he writes as follows:

"I remarked that from north to south in traversing these hundred leagues (300 geographical miles) from the said islands (Azores) the needle of the compass, which hitherto had turned toward the NE., turned a full quarter of the wind to the NW., and this took place from the time we reached that line."[a]

Continuing, he says, "For in sailing thence (from the Azores) westward the ship went on rising smoothly toward the sky and then the weather was felt to be milder, on account of which mildness the needle shifted one point of the compass; the further we went the more the needle went to the NW., this elevation producing the variation of the circle which the North Star describes with its satellites."[b]

A second point in the line of no magnetic declination, situated farther north than the one of Columbus, was found by Sebastian Cabot and dates from 1497 or 1498. He found, when on the meridian 110 miles west of the island of Flores, one of the Azores, and in latitude approximately 46° or 47°, that he was in a position where the needle had "no variation."[c]

This line along which the needle pointed exactly to the north, one point of which had been discovered by Columbus and another by Sebastian Cabot, was believed to be a convenient line, "given by nature herself," from which to reckon longitude, especially as it almost passed through the place from which longitude was then reckoned, and it figured prominently for many years in political geography as the line of demarcation between the rival kingdoms of Portugal and Castile. It can be seen, however, by referring to Fig. 4, that this line does not coincide with a true meridian and that it is

[a] Select letters of Columbus, 2d edition, translated and edited by H. Major, London, 1870; printed for the Hakluyt Society, pp. 131, 135.

[b] Regarding this passage Schott (App. 19, U.S. Coast and Geodetic Survey Report for 1880, p. 414) says: "It is evident that the extract from the third voyage is but an amplification of his first account, and expresses his conviction that west of the Azores, where the declination was a little easterly, it changed to the westward, being nearly zero at Corvo, and gradually increasing to one point or 11° W. at a distance of 300 nautical miles west of the longitude of Corvo. The position of Rosario, on the southeast part of the island of Corvo, is, according to the Carta Esferica de las Islas Azores, Madrid, 1855, in latitude 39° 41′ and longitude 24° 53′ west of San Fernando, or in 31° 07′ west of Greenwich (according to the Conn. des Temps); 100 leagues or 300 nautical miles west of this longitude would correspond (in latitude 28°) to 5° 40′ and would bring the Columbus line in longitude 36° 47′ W."

[c] In App. 7, U. S. Coast and Geodetic Survey Report for 1888, p. 305, second footnote, Schott says: "Soon after the discovery by Columbus of a point of no variation in the Atlantic, Sebastian Cabot discovered a second one farther north and evidently belonging to the same agonic curve. Livio Sanuto states in his Geographica Distincta (Venice, 1588) that he procured the information from Sebastian Cabot and made use of his map (probably that composed in 1544), on which the position of the meridian intersecting the point of no variation was seen to be 110 miles to the west of the island of Flores, one of the Azores; see Narrative and Critical History of America, by Justin Winsor, Vol. III, Boston and New York, 1884, p. 41. This discovery was probably made on the second voyage of the Cabots, in 1498, although it may have been noted in the first, 1497, by the elder Cabot. The latitude of the point is uncertain, but may be approximated from the fact that in the first voyage land was apparently sighted at Cape Breton, and in the second the coast of New Foundland (Baccalaos), which is said to have been made from the north."

moreover a very devious and variable line, ever changing its course and form with the lapse of time.

Thus by the end of the fifteenth century the two new facts that the compass needle does not, in general, point true north or south, but a certain amount east or west, and that the amount varies with locality, had become known among western nations; Columbus must be credited with their discovery.[a] *The necessity for measuring the angle of pointing of the needle thus became apparent in 1492, and hence this must be regarded as the year of birth of the science of terrestrial magnetism, which has for its special object the measurement of the earth's magnetic elements.*

Discovery of the Magnetic Declination on Land.

According to Hellmann,[b] "It was the construction of sundials that first brought those on land to a true perception of the declination of the magnetic needle from the

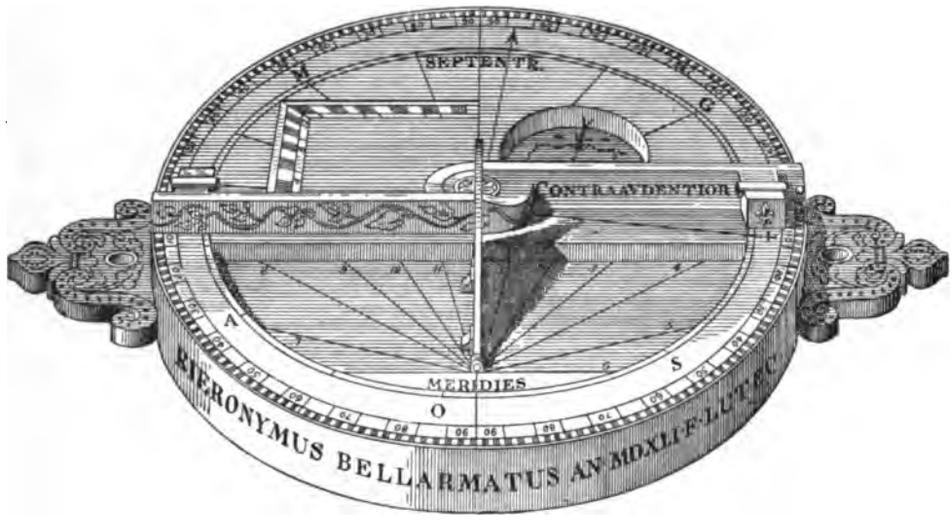


Fig. 5.—Compass sun-dial showing earliest magnetic declination at Paris (1541).

astronomical meridian" and "not the discovery of Columbus, of which nothing appeared in print." In the early part of the sixteenth century the quaint old German town of Nuremburg was quite a center for the manufacture of sundials provided with magnetic needles, which found a ready market not only in Germany but in many other countries and were widely used.

One of the most famous of these "compass makers," as the makers of these compass sundials were called, was Georg Hartmann, who lived in Nuremburg from the

[a] Columbus is generally credited merely with the discovery of the second fact, viz, the change of the magnetic declination from place to place. However, no satisfactory evidence has thus far come to light, as has been shown, that the first fact was known before his time, except apparently among the Chinese.

[b] "The Beginnings of Magnetic Observations," by G. Hellmann, Journal Terrestrial Magnetism, Vol. IV, pp. 73–86.

year 1518 until his death, serving as vicar of the famous church of St. Sebaldus. Hartmann lived in Rome about 1510 and appears to have made there the first observation of the magnetic declination on land, finding that the magnetic needle pointed at Rome 6° east of north. Apparently he did not make known this discovery until in a letter written March 4, 1544, to Count Albert of Prussia. In his letter he also says that at Nuremburg the needle points 10° and "at other places more or less."

Fig. 5 is a reproduction of an ivory sundial found by Le Monnier[a] in the collection of Prince de Conti and constructed by Hieronymus Bellarmartus. It shows that the needle at Paris pointed in 1541 about 7° east—this being the oldest known value at Paris.

Early Methods for Determining the Magnetic Declination and the Earliest Values on Land.

The earliest method was that used by Columbus of noting the magnetic bearing of the Pole Star. A Sevillian apothecary, Felipe Guillen, devised an instrument which he presented to the King of Portugal, João III, in 1525, and which he termed "*brújula de variación.*" By means of this instrument the declination was determined by noting with the aid of the shadow thrown by a stylus, the magnetic bearing of the Sun at equal altitudes before and after noon; the half difference of the bearings was the declination.

The first one who published useful methods for determining the magnetic declination appears to have been *Francisco Falero*[b] in 1535. In Hellmann's "Rara Magnetica" is reproduced the special chapter on this subject entitled "Del Nordestear de la Agujas." According to Hellmann, *in Falero's book is found the first reference in print to the magnetic declination.*

He gives the following three methods for its determination: (1) Magnetic bearing of Sun at apparent noon when the shadow of the stylus falls to the north; (2) Guillen's method, and (3) magnetic bearing of Sun at sunrise and sunset.

In 1537 Pedro Nunes improved Guillen's instrument, adding the means for measuring the Sun's altitude and inventing a new method for the determination of latitude at any time of day.

The first fairly extensive series of carefully made declinations at sea is due to João de Castro, who in 1538 commanded one of eleven ships sent to the East Indies by the Infanta Dom Luiz and who later became the fourth vice king of India. He diligently made magnetic, meteorological, and hydrographic observations on the entire voyage.[c]

The first treatise published on the subject in England was that of W. Borough: "A Discours of the Variation," London, 1581, annexed to Norman's "Newe Attractive," and republished with it three times (1585, 1596, and 1614). The methods in principle are Falero's. Borough gives in this book his observations for determining the magnetic declination at London (Limehouse), on October 16, 1580, being

[a] *Le Monnier:* "Histoire de l'Académie Royale de Sciences," Année, 1771, p. 29. The cut is reproduced from Hellman's article cited above.

[b] Tratado del Esphera y del arte del marear, Sevilla, 1535.

[c] The most recent collection and utilization of the values will be found in van Bemmelen's "Die Abweichung der Magnetnadel," Batavia, 1899.

doubtless the first observations printed in detail. He deduced from these a value of 11° 15′ E.[a]

The first collection of values (42) of the magnetic declination of the sixteenth century, which, however, was far from being complete, was contained in Simon Stevin's "De Havenvinding," published in Dutch, at Leyden, in 1599.[b] This was translated into Latin by Hugo de Groot (Grotius) under the title of "Διμεντρετικη sive portuum investigandorum ratio," and likewise published in 1599. It was translated by Edward Wright into English and published separately, and also appended to the third edition of his Errors in Navigation; the table of declinations had appeared already in the second edition of his work. The following definition of the magnetic declination taken from Grotius's translation is of interest: "Declinatio magneticæ à Septentrione ad Orientem, ἀνατλισμὸς vocatur, Occidentem versus δυσισμὸς, et nomine universali χαλιβόκλισις: χαλυβόκλισις[c] ante et ὀρθοβορεοδειξις generali χαλυβοδείξεως nomine appellantur."

It will be seen that he used the term "magnetic declination" to denote what Norman, Borough, and, later, Gilbert termed as "variation of the compass.[d] The same writers used the word "declination" to denote what is now known as dip or "inclination." Because of this confusion of terms, careful scrutiny of the early references regarding "declination" is necessary. Instead of Grotius's terms, "anatolismos" for east declination and "dusismos" for west declination, the Dutch original has "Ostering" and "Westering," respectively, whereas Wright uses "variation west" and "variation east." The terminology of Grotius was extensively used by the seventeenth century authors of works on magnetism in the Latin language. Stevin's interesting little work owed its origin to the patronage of Count Moritz of Nassau, admiral of the Dutch fleet, who saw the great importance in navigation of accurate knowledge of the magnetic declination.

Table I represents an attempt to collect the values of the magnetic declination up to the year 1600, inclusive, for places on land or in its vicinity, for which the year of observation is known or for which it is possible to assign an approximate date. As the fact of the secular change of the magnetic declination did not become known until the next century, it was not customary to affix a date to an observation.[e] The sign ± in the table means that the date is approximate. The values obtained with sea compasses require careful scrutiny, as these compasses were frequently shifted to allow for the supposed variation or "error" of the needle. Thus, Robert Norman, instru-

[a] Actual mean was 11° 18′ or nearly 11⅓°, the quantity given by Gilbert in the "De Magnete." Both Norman and Borough persistently give 11° 15′. Gellibrand later recalculated Borough's observations, making allowance for atmospheric refraction, and deduced a mean value of 11° 16′. (See "Walker's Terrestrial and Cosmical Magnetism," 1866.)

[b] The table of values was obtained by Stevin from the cartographer P. Plancius, who is said to have entered them on a globe or a chart completed in 1592. Hence they refer to dates prior to 1592.

[c] From χαλυψ (genitive, χαλυβος), steel, and κλινειν, to decline, hence, declination of the magnet.

[d] The term "variation" may have been derived from Guillen, who termed his instrument for determining it "brújula de variación." (See p. 26.)

[e] "And although this variation of the needle be found in Trauell to be divers and changeable, yet at any land or fixed place assigned it remaineth always one, still permanent and abyding." R. Norman, "The Newe Attractive," 1581.

ment maker, in 1581, says: "Of the common Sayling Compasses, I find heere (in Europa) five sundry sortes or sets"—according to the amount of correction allowed for by different makers. Thus, "by the Isle of Saint Michaell in the Acorres," he found "that the North poynt of the common compass, showeth the Pole very neere in that *Meridian*, but the bare Needle sheweth about 4 Degrees 50 Minutes to the Eastwards of the Pole."

It was not until the close of the sixteenth century that the "variation from the true north" came to be generally accepted as an actual fact of nature and not one to be accredited to the imperfection of the construction of the compass.

TABLE I.—*Earliest values of the magnetic declination up to 1600 for places on land or in its vicinity.*[a]

No.	Date.	Place.	Country.	Latitude.	Longitude.	Magnetic Declination.	Authority or observer.
				° ′	° ′	° ′	
1	1436 (prior)	Rome	Italy	41 54 N	12 27 E	[b]5 E	L. A. Bauer from Compass Charts
2	1510±	do.	do.	41 54 N	12 27 E	6 E	Georg Hartmann
3	1518±	Bay of Guinea	Africa	.. ..	.. ..	(11¼ E)	Piero di Giovanni d'Antonio di Dino
4	1520±	Vienna	Austria	48 15 N	16 21 E	4 E	Johann Georg Tannstetter (Rheticus)
5	1523 (?)	Landshut (?)	Germany	.. ..	.. ..	9 E	Petrus Apianus
6	1532±	Ingolstadt	do.	.. ..	.. ..	10 30 E	Do.
7	1534	Dieppe	France	49 56 N	1 05 E	10 E	François or Crignon
8	1537	Florence	Italy	.. ..	.. ..	9 E	Mauro (Sphera volgare novamente tradotta. Venetia, 1537. 4°, fol. 53a)
9	1538	Nuremburg	Germany	.. ..	.. ..	10 15 E	Georg Hartmann
10	1538, April	Lisbon	Portugal	38 42 N	9 08 W	7 30 E	João de Castro
11	1538, Aug. 10	Mozambique	Africa	15 02 S	40 46 E	6 45 E	Do.
12	1539±	Dantzig	Germany	.. ..	.. ..	13 E	Georg Joachim Rheticus
13	1541	Paris	France	48 52 N	2 20 E	7 E	Hieronymus Bellarmatus
14	1544±	Nuremburg	Germany	.. ..	.. ..	10 E	Georg Hartmann
15	1546±	Island Walcheren	Holland	.. ..	. ..	9 E	Gerhard Mercator
16	1550	Paris	France	48 52 N	2 20 E	8 E	Orontius Finæus
17	1556, July 17	Petchora R. (mouth)	Russia	69 10 N	55 00 E	3 30 W	Stephen Borough
18	1556, July 27	Nova Zembla (S. coast)	do.	70 42 N	57 30 E	7 30 W	Do.
19	1556, Aug. 6	Vaigatch I. (coast)	do.	70 25 N	59 00 E	8 00 W	Do.
20	1557	Kholmogery	do.	64 25 N	41 50 E	5 10 E	Do.
21	1557, June 2	Dogsnose (2 miles on shore to northward)	do.	65 47 N	40 00 E	4 00 E	Do.
22	1557, June 16	Kola Peninsula	do.	66 59 N	39 30 E	3 30 E	Do.
23	1569	Böckstein	Austria	47 05 N	13 07 E	15 00 E	[Doppler's collection]
24	1575±5	St. Michael Island	Azores	37 00 N	25 00 W	4 50 E	R. Norman
25	1576, June	Gravesend	England	51 23 N	0 20 E	11 30 E	Frobisher
26	1576, June	Fair Island (SW. of)	Scotland	59 20 N	2 10 W	11 09 E	Do.

[a] Compiled from the following sources: No. 1 derived from Bianco's compass charts (see p. 21); 2–15, inclusive, from Hellmann and Wagner's collections (Journal "Terrestrial Magnetism," Vol. IV, p. 80, and Vol. VII, No. 2); No. 24 from Norman's "The Newe Attractive," (see citation, p. 43; the date was approximately assigned), Nos. 31 and 33, from W. Borough's "Variation of the Compass," 1581. (Norman in his book also states that he found at London 11° 15′ by his own observation. Doubtless Borough and Norman made the London observation together.) The rest of the observations except No. 28 (see footnote c) are taken from Hansteen's "Magnetismus der Erde," and principally from van Bemmelen's valuable collections, "Ab weichung der Magnetnadel," Batavia, 1899.

[b] It is a curious coincidence that this value agrees precisely with the one (5° E.) which had been for so long erroneously ascribed to Peregrinus, as having been observed by him in 1269. See p. 20.

TABLE I.—*Earliest values of the magnetic declination up to 1600 for places on land or in its vicinity*—Continued.

No.	Date.	Place.	Country.	Latitude.	Longitude.	Magnetic Declination.	Authority or observer.
				° ′	° ′	° ′	
27	1579	Bermejo Port	South America	50 25 S	75 00 E	0 00	P. Sarmiento de Gamboa
28	1579 (?)	Cape Mendocino (near)	California	39 00 N	124 00 W	[a]9 00 E	Sir Francis Drake
29	1580, Apr. 17	Astrakhan	Russia	46 21 N	48 02 E	13 40 W	Chr. Borough
30	1580, June 11–16	Bildih	do.	40 25 N	49 30 E	10 40 W	Do.
31	1580, Oct. 4	Derbent	do.	42 05 N	48 15 E	11 00 W	Do.
32	1580, Oct. 16	London	England	51 31 N	0 08 E	11 15 E	W. Boroughs and R. Norman
33	1580	Paris	France	48 52 N	2 20 E	11 30 E	Severtius
34	1581 (before)	Vaigatch Island	Russia	70 ± N	58 ± E	7 00 W	W. Boroughs
35	1587, Apr.	Maipo	South America	34 00 S	71 39 W	2 30 W	Cavendish
36	1587, May 25.	Puna	do.	2 45 S	80 00 W	2 00 E	Do.
37	1587, Aug.	Mauranilla	Mexico	18 15 N	104 00 W	2 00 E	Do.
38	1587	Cape Corientes	do.	20 45 N	106 00 W	2 00 E	Do.
39	1587	Cape San Lucas (near)	do.	22 55 N	111 56 W	3 00 E	Do.
40	1587, June 30	Greenland, E. coast		72 10 N	56 00 W	28 00 W	Davis
41	1587, July 23	Cumberland Bay, NW. end		67 00 N	67 30 W	30 00 W	Do.
42	1589, Aug. 14	Santa Cruz (Flores)	Azores	39 50 N	30 40 W	[b]4 00 W	Edward Wright
43	1589, Sept. 13	Fayal, in the town	do.	38 50 N	27 40 W	[b]1 30 E	Do.
44	1589, Sept. 22	do.	do.	38 50 N	27 40 W	[b]4 40 E	Do.
45	1589, Sept. 23	do.	do.	38 50 N	27 40 W	[b]3 10 E	Do.
46	1589, Nov. 12	NE. of Cape Finisterre	Spain.	44 25 N	10 00 W	[c]7 00 E	Do.
47	1594	Off Cape St. Vincent	do.	37 05 N	9 10 W	5 15 E	Robert Dudley
48	1595, Jan.	Off Cape Barbas	Africa	22 00 N	17 00 W	3 00 E	Do.
49	1595, Jan.	Off Cape Roxo	Porto Rico	17 54 N	67 5 W	3 00 W	Do.
50	1595, Aug. 4	Bay Aguada de Sambras (Mossel Bay?)	Africa	34 10 S	22 00 E	0 00	Corn. Houtman
51	1595, Sept. 3	Off Cape San Roman	Madagascar	25 30 S	46 50 E	13 00 W	Do.
52	1596, June 22	Entrance Sunda Sts.		6 00 S	104 20 E	4 00 W	Do.
53	1596, June 9	Bear Island (Cherry)		74 10 N	16 00 E	13 00 E	Willem Barentsz
54	1596, June 23	Hinlopen Strait	Spitzbergen	16 00 N	79 40 W	17 00 E	Do.
55	1596, July 21	Nova Zembla, Cross I.	Russia	76 45 N	59 00 E	26 00 W	Do.
56	1596, July 31	do.	do.	76 45 N	59 00 E	17 00 W	Do.
57	1596	Nova Zembla, Langeneus	do.	73 40 N	53 30 E	25 00 W	Do.
58	1596	Vaigatch Island	do.	69 10 N	61 10 E	24 30 W	Do.
59	1596	Williams Island	do.	75 50 N	58 30 E	33 00 W	Do.
60	1596	Yshoek	do.	76 55 N	67 30 E	27 00 W	Do.
61	1596	Nova Zembla	do.	76 07 N	68 34 E	26 00 W	Do.
62	1596–99	Graz	Austria	47 07 N	15 25 E	6 00 W	J. Kepler
63	1597, Feb.	Bali Strait, east end of	Java	8 30 S	114 50 E	[d]2 00 W	Corn. Houtman
64	1597, Apr. 24	Africa (SE. coast)		32 30 S	28 50 E	5 00 W	Do.
65	1597, May 4	Off Cape of Good Hope		34 50 S	18 20 E	0 30 E	Do.
66	1597, Aug. 11	Off Egmont	Holland, coast	52 30 N	4 20 E	15 00 E	Do.
67	1598, June 28	Off Martin Vaz I.		20 38 S	31 13 W	11 10 E	Van Neck
68	1598, Sept. 28	Off Mauritius Island		20 27 S	67 30 E	22 15 W	Do.
69	1598, Dec. 31	Off Bantam	Java	6 00 S	106 10 E	5 10 W	Do.

[a] This value is given on a map by R. Dudley in the "Arcano del Mare," and preserved by Petrus Koerius, dated 1646, showing the coast of New Albion, discovered by Sir F. Drake in 1579. Narrative and critical history of America, Justin Winsor, vol. 2, Boston and New York, 1886.

[b] These observations, according to Hansteen, were made by Wright with W. Boroughs' compass described in B.'s book

[c] This value is given by Hansteen in one place as 7° 40′, in another as 7° 04′; Van Bemmelen apparently rounds off the value to 7°.

[d] Not quite 2°.

TABLE I.—*Earliest values of the magnetic declination up to 1600 for places on land or in its vicinity*—Concluded.

No.	Date.	Place.	Country.	Latitude.	Longitude.	Magnetic Declination.	Authority or observer.
				° ′	° ′	° ′	
70	1599, Feb. 9	Off Arosbaya	Madura Island	7 00 S	112 50 E	2 30 W	Van Neck.
71	1599, Apr. 3	Amboina, west end		3 26 S	128 30 E	3 10 E	Do.
72	1599, Apr. 19	Off Ternate and Tidore		1 02 N	127 20 E	3 10 E	Do.
73	1600, May 7	Off St. Helena Island		15 55 S	5 43 W	7 38 E	Do.
74	1600, May 22	In bay, I. Ste. Marie	Madagascar	15 40 S	47 30 E	16 30 W	Wilkens
75	1600, July 13	Off Maldive Islands	Indian Ocean	2 00 N	73 00 E	15 00 W	Do.
76	1600	Between Buru and Amboina	Dutch E. I.	3 45 S	127 30 E	3 00 E	Do.
77	1600, Sept.	Off Bantam	Java	6 00 S	106 10 E	5 00 W	Do.
78	1600	Constantinople	Turkey	41 01 N	28 50 E	0 00	
79	1600 (before)	Antwerp	Belgium	51 13 N	4 24 E	9 00 E	
80	1600	Konigsberg	Prussia	54 42 N	20 26 E	0 00	
81	1600 (before)	Plymouth	England	50 26 N	4 19 W	13 24 E	
82	1600, Sept. 26	Cape San Sebastian	Madagascar	12 42 S	47 40 E	16 00 W	J. Lankester

Glancing over these values, it will be seen that in the sixteenth century the needle pointed east of north over the greater part of Europe, whereas now it as persistently points west, except in the eastern part. *Cf.* the charts of lines of equal magnetic declination for 1500 (Fig. 4) and 1600 (Fig. 17).

DISCOVERY OF THE MAGNETIC INCLINATION.

The year 1581 is memorable as having produced the first two works treating distinctively of the earth's magnetism. The first, that of Robert Norman, entitled "The Newe Attractive,"[a] heralded to the world an entirely new fact about the magnetic needle—"a newe discovered secret and subtill propertie concernyng the Declinyng of the Needle, touched therewith under the plaine of the Horizon." *This discovery of the dip of the needle below the horizon was made in 1576 by Norman, a practical seaman, or "hydrographer," as he styles himself, and an instrument maker. Thus the second element of the earth's magnetism came to light and gave another incentive for magnetic measurements.* In Chapter III of his quaint and exceedingly rare book he relates "by what meanes the rare and strange declining of the Needle, from the plaine of the horizon was first found."

"Hauing made many and diuers compaſſes, and uſing alwaies to finiſh and end them before I touched the needle, I found continually, that after I had touched the yrons with the Stone, that preſently the north point thereof would bend or *Decline* downwards under the Horizon in ſome quantitie: inſomuch that to the Flie of the compaſſe, which before was made equall, I was ſtill conſtrained to put ſome ſmall peece of waxe in the South part thereof, to counterpoiſe this *Declining*, and to make it equall againe.

"Which effect having many times paſſed my hands without any great regard thereunto, as ignorant of any ſuch propertie in the Stone, and not before hauing heard nor

[a] Principal parts reproduced in facsimile in Hellmann's reprints, "Rara Magnetica," Berlin, 1898.

read of any ſuch matter: It chaunced at length that there came to my hands an Inſtrument to bee made, with a Needle of ſixe inches long, which needle after I had polliſhed, cut off at Juſt length, and made it to ſtand levell upon the pinne, ſo that nothing reſted but onely the touching of it with the stone: when I had touched the ſame, preſently the north part thereof *Declined* downe in ſuch ſort, that beeing conſtrayned to cut away ſome of that part, to make it equall againe, in the end I cut it too ſhort, and ſo ſpoyled the needle wherein I had taken ſo much paynes.

"Hereby beeing ſtroken in ſome choller, I applyed my self to ſeeke further into this effect, and making certayne learned and expert men (my friends) acquainted in this matter, they adviſed me to frame ſome Inſtrument, to make ſome exact tryal, how much the needle touched with the Stone would *Decline*, or what greateſt Angle it would make with thee plaine of the Horizon. Whereupon I made diligent proofes: the manner whereof is ſhewed in the Chapter following."

Chapter IV next tells "how to finde the greatest Declining of the Needle, under the Horizon":

"Take a ſmall Needle of Steele wier, of five or ſixe inches long, the ſmaller and the finer mettall the better, and in the middle thereof (croſſe the ſame) by the beſt means you can, fixe as it were a ſmall Axeltree of yron or braſſe, of an inch long, or thereabout, and make the ends thereof very ſharpe, whereupon the Needle may hang levell, and play at his pleaſure.

"Then provide a round plaine Inſtrument like an Aſtrolobe, to be divided exactly into 360 partes, whoſe diameter muſt be the length of the Needle, or thereabout, and the ſame inſtrument to bee placed uppon a foot of convenient height, with a plumme line to ſette it perpendicular.

"Then in the Center of the ſame Instrument place a peece of Glaſſe hollowed, and againſt the ſame Center uppon ſome place of Braſſe that may be fixed upon the foot of the Inſtrument, fit another peece of Glaſſe, in ſuch ſorte that the ſharpe endes of the Axeltree beeing borne in theſe two Glaſſes, the Needle may play freely at his pleaſure, according to the ſtanding of the Inſtrument.

"And the Needle muſt be ſo perfected, that it may hang upon his Axeltree both ends levell with the Horizon, or being turned, may ſtand and remaine at any place that it ſhall be ſette: which being done, touch the ſaide Needle with the *Magnes* ſtone, and ſet the Inſtrument perpendicular by the plumme line, and turne the edge of the Inſtrument South and North, ſo as the Needle may ſtand duley according to the *Variation* of the place: which *Variation* the Needle of his owne propertie would ſhew, were it not that he is conſtrained to the contrarie by the Axletree.

"Then ſhall you ſee the *Declination* of the North point of the touched Needle, which for this Citie of London, I finde by exact obſervation to be about 71 degrees 50 minutes. This forme of the inſtrument heere deſcribed with the manner of the declination, I have heere placed that it may be the eaſier conceived."

He next proves by experiment and weighings that it is not want of balance of needle nor the rubbing of it with the loadstone that makes this "declining of the needle."

One can not but admire the painstaking and conscientious labors of Norman and the precision with which he set out to determine the amount of "declining." It will

be noted that he explicitly states that the angle must be determined with the instrument standing "duley according to the Variation of the place"—that is, in the magnetic meridian. It is curious, however, that he should call this the "greatest declining," whereas in the plane of the magnetic meridian the declining is really *the least*, the angle increasing as the instrument is turned away from the magnetic meridian and reaching its maximum amount of 90° in a magnetic east and west plane. How exact his observation of 71° 50′ is can not be judged in the absence of further details.

From the letter, cited on page 26, which the famous vicar of Nuremburg, Georg Hartmann, wrote March 4, 1544, to Count Albert of Prussia, it is apparent that he had already become aware of the dipping of the north end of the needle. He says: "Besides, I find this also in the magnet, that it not only turns from the north and deflects to the east about 9° more or less, as I have reported, but it points downward. This may be proved as follows: I make a needle a finger long, which stands horizontally on a pointed pivot, so that it nowhere inclines toward the earth but stands horizontal on both sides. But as soon as I stroke one of the ends (with the lodestone), it matters not which end it be, then the needle no longer stands horizontal, but points downward some 9° more or less. The reason why this happens I was not able to indicate to His Royal Majesty."

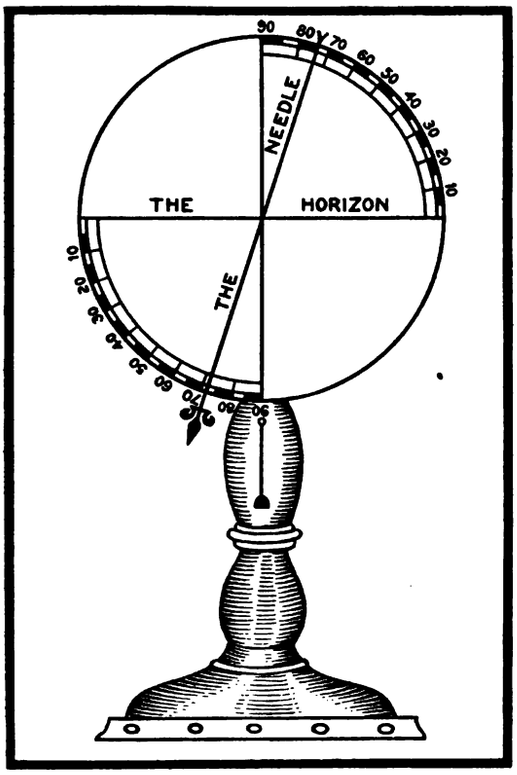


FIG. 6.—First Dip Circle (Norman's 1576).

Hartmann's letter was not published until it was rescued from oblivion in the third decade of the nineteenth century, and its contents do not appear to have been known to Norman or to any of the writers of that period. It was recently republished in facsimile by Hellmann in his "Rara Magnetica." Hartmann did not mount his needle in such a manner as to show the precise amount of dip, as did Norman, but simply observed the dip of the north end of a *compass* needle, mounted as ordinarily, on a pivot, so that instead of getting about 65°, as he ought to have done, he only found 9°. As is well known the dip of the north end of a compass is nowadays usually overcome in the northern magnetic hemisphere by a sliding brass weight or ring on the south end. *Accordingly, the principal credit for the discovery of the magnetic dip must undoubtedly be assigned to Norman.*[a]

It is a keen pleasure to peruse Norman's book, which was so popular that it was

[a] It has also been claimed that reference to the dip of the needle is made in Fortunius Affaytatus's book, "Physicae et astronomicae," published in 1549, but this does not appear to be the case.

republished four times (1585, 1596, 1614, and again in 1720, bound with Whiston's treatise), and note the admirable and modest manner in which he relates his experiments and discoveries, differing greatly in this respect from Gilbert, who, in his great work (1600), vehemently abuses almost every writer on magnetism and rarely credits anyone with the facts previously discovered.

Norman must clearly be given credit for being the first to divine that the point or source of power which the needle respects is in the earth and not in the heavens, as had been generally supposed before his time. He says:

"And by the *Declining* of the Needle, is alſo proved, that the point *Reſpective*, is rather in the earth than in the Heavens, as ſome have imagined; and the greateſt reaſon why they ſo thought (as I judge) was becauſe they never were acquaynted with this *Declining* in the Needle, which doubtleſſe if *Martin Curtes* had known, he would not have judged the *Attractive* point to have been in the Heavens, or without them, but rather in the earth."

Note also this remarkable sentence: "And surely I am of opinion, that if this Vertue could by any means be made viſible to the Eye of man, it would be found in in a spherical forme, extending rounde about the Stone in great Compaſſe, and the dead bodie of the Stone in the middle thereof. Whose center is the center of his aforeſaid Vertue. And this I have partly prooved and made Viſible to be seene in some manner, and God sparing mee life, I will herein make further Experience and that not curiouſly, but in the Feare of God, as neare as he shall give mee grace, and meane to annex the same unto a Booke of Navigation, which I have had long in hand."

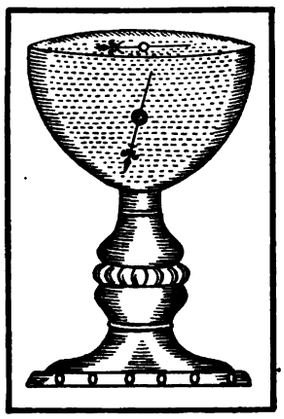


FIG. 7.

This is undoubtedly the source from which Gilbert got his idea of the "orbs virtutis"—the circular orb of virtue surrounding the globular lodestone. In fact, Gilbert in no way improves on Norman's idea but adopts it bodily. Some writers have extravagantly asserted that Gilbert anticipated Faraday's conception of the field of force surrounding a magnet.

Norman also proves experimentally that the attraction exerted on the magnet does not produce motion of translation but simply that of rotation (of the compass needle and of the dip needle).[a] His figure illustrating the experiment is herewith (Fig. 7) reproduced (half size).

[a] In experiments with the terrella the needle is attracted obliquely or directly toward the globe with a very perceptible force. This is because the length of the needle is so considerable in proportion to the diameter of the globe that the magnetic forces on the two ends are not equal and parallel. But the length of the longest of mariner's compass needles is not more than about $\frac{1}{40\cdot000\cdot000}$ and the length of the largest bar magnet that has ever been suspended so as to show by its movements any motive tendency it may experience from the force of terrestrial magnetism is not more than $\frac{1}{10\cdot000\cdot000}$ of the Earth's diameter, and therefore magnetic needles or bar magnets experimented on in any part of the world experience no sensible attraction toward or repulsion from the Earth and show only a directional tendency according to which a certain line of the magnet, called its magnetic axis, takes the direction of the curved lines of force. ("Terrestrial magnetism and the mariner's compass," by Sir W. Thomson (Lord Kelvin) in Popular Lectures and Addresses, Vol. III, Navigation, pp. 228–337).

THE EARTH, A GREAT MAGNET.

GILBERT'S "DE MAGNETE."

The year 1600 is generally regarded as a memorable one in the history of the sciences of magnetism and electricity, for in this year appeared Dr. William Gilbert's famous work "De Magnete," published at London, dedicated in his prefatory remarks to the "True philosophers, ingenuous minds who not only in books but in things themselves look for knowledge," and treating in five books or sections of the properties of magnetic bodies and of the "great magnet, the Earth." It was republished in Latin at Stettin (Sedini) in 1628 and 1633 by Wolfgang Lochmann, reprinted in 1892 in facsimile (photozincograph reproduction of 1600 edition) by Mayer and Müller, of Berlin, and translated into English for the first time by P. Fleury Mottelay,[a] and more recently under the auspices of the Gilbert Club.[b]

William Gilberd, or as more usually written Gilbert, was born in the year 1540 in Holy Trinity Parish at Colchester, England, being the eldest of five sons of Jerome Gilbert, at one time recorder. Matriculating at the age of 18 at St. John's College, Cambridge, he in due course took the degree of B. A.; he also became a Symson Fellow in 1561, an M. A. in 1564, and during the two years following was mathematical examiner of his college. He next studied medicine, reaching his doctorate and a senior fellowship in 1569, when he terminated his eleven years' connection with the university, after which he spent four years on the Continent.

Upon his return to London he practiced as a physician for thirty years with "great success and renown," and was made a Fellow of the Royal College of Physicians, later censor, then treasurer, next consilarius, and finally, in 1600, president of the college. In the same year Queen Elizabeth appointed him one of her body physicians and settled upon him a pension to enable him to prosecute his scientific researches. After her death Gilbert was continued in his office by James I. He died in November, 1603, and was buried in Trinity Church, Colchester. His books, papers, and collections, bequeathed to the Royal College of Physicians, were unfortunately destroyed in the "great fire."

It is not known how Gilbert, a successful physician, was led to devote himself so zealously and so unremittingly to the study of magnetism. He says "There is naught in these books (De Magnete) that has not been investigated and again and again done and repeated under our eyes." Herein consists the chief value of the work—that nearly every conclusion drawn rests on experiment made over and over again under slightly varying conditions, for, as he says, "stronger reasons are obtained from sure experiments and demonstrated arguments than probable conjectures, and the opinions

[a] Published in 1893 by Quaritch, of London, and Wiley & Sons, of New York.

[b] President of the Club, Lord Kelvin. The translation was prepared from the original edition of 1600 by a Committee of the Club formed for this purpose in 1889, which finished its labors in 1900. The printing was undertaken in 1901 at the Chiswick Press by Messrs. C. Whittingham & Co., the edition being unfortunately limited to 250 copies. Prof. Sylvanus P. Thompson, one of the secretaries of the Club who took a most active part in the translation, has issued at his own expense his most valuable and useful commentaries, entitled: "Notes on the De Magnete of Dr. William Gilbert," privately printed, London, 1901. As the Gilbert Club's translation is not yet at hand, the quotations given above are according to Mottelay.

of philosophical speculators of the common sort." It is said that he spent £5,000 on his experiments, "examining very many matters taken out of the lofty mountains, of the depths of the seas, or deepest caverns, or hidden mines," in order to discover the true substance of the Earth and of magnetic forces.

The De Magnete was the most complete summary of the properties of magnetic bodies up to 1600. One reading this work alone, however, must by no means infer that all the properties and laws set forth were discovered by Gilbert, for he very rarely gives credit to any previous discoverer. He frequently exhibits intolerance and lack of appreciation of the work of his predecessors, and like his experiments, repeats his vituperations and assertions over and over again, so that one is unconsciously led to believe that all previous work had resulted in very little of real value.

Doubtless the fact that he thoroughly tested anew everything he had heard regarding magnetic substances, and accepted nothing on faith led him to regard all as his own and thus prevented him from giving credit where credit was rightfully due. The weak points of others, however, he never fails to expose and ridicule.

Gilbert terms the end of the lodestone or needle which points to the north, the south pole, and the opposite end, the north pole, for similar reasons to those already set forth. And by reiterating over and over Gilbert would apparently desire to convey the impression that he was the first to recognize the fact that the magnetism residing in the north-pointing end of a magnetic needle is of an opposite kind to that at the Earth's north magnetic pole, although this fact was clearly recognized by many writers previously, beginning with Peregrinus in 1269. Gilbert must be simply credited with proposing to designate, because of the fact stated, the north-seeking end of the needle, the south pole—a proposal which, by the way, has not been accepted by modern writers.

One can not fail, however, to recognize that Gilbert did a most useful piece of work in so carefully scrutinizing, weighing, and summarizing in suggestive and descriptive language all knowledge of magnetic properties. *As a work on magnetism and electricity, Gilbert's De Magnete is still a standard one; as a work on terrestrial magnetism, however, it was weak even for its time, its conclusions and deductions having all been discredited with the exception of one, the truth of which he got right more by chance than by philosophical reasoning, viz, that the "Earth itself is a great magnet."*

As said, Gilbert's work as a treatise on terrestrial magnetism was by no means equal to his work on the general properties of magnetic bodies. When he came to theorize on the "Earth as a magnet" he forgot his own injunction to philosophers who but dream and speculate from books, saying that they "must be aroused and taught the uses of things, the dealing with things; they must be made to quit the sort of learning that comes only from books,[a] and that rests only on vain arguments from probability and upon conjectures."

Although he is credited as having determined a dip of 72° at London, and by Kircher as having found the declination to be 6°[b] at London, his work contains nothing to lead one to suppose that he obtained the declination and dip himself. He repeatedly points out the errors of observations by others, but makes no attempt whatsoever to

[a] Gilbert might have added: "and mere laboratory experiments."

[b] In 1580 the declination at Limehouse, London, was 11¼° E., and in 1600 about 10° E.

test by actual observation at various places the deductions drawn from his terrella, or spherical lodestone, and directly applied to the Earth. It is claimed that the chapter on methods for finding the "variation of the compass" was written by his friend Edward Wright, a practical navigator. His book does not even contain a systematic collection of all observations up to his time, such as that made, for example, by Plancius and published in Stevin's work the year before. Had Gilbert been equally as zealous in observing the terrestrial magnetic elements as he was in his laboratory experiments, he might have stumbled on a fact—the secular change of the magnetic declination—which would doubtless have shaken him, to some extent at least, in his belief that the "Earth was a great lodestone;" for one of the fixed and necessary postulates of his theory was the constancy of the magnetic declination at any place.

Gilbert reached his conclusion that the "Earth is a great magnet," *i. e.*, that its "magnetic virtue" comes from within the Earth and not from the heavens above, solely by analogy between the Earth and a globular lodestone which he termed a "terrella," and which he had had expressly made for his experiments to represent the Earth on a miniature scale. The reasoning whereby he was led to the conclusion (Book I, Chapter XVII) that the "terrestrial globe is magnetic and is a lodestone," upon which his frame largely rests, would not be accepted to-day, and, in fact, was not accepted by writers after the discovery of electro-magnetism. The problem was not definitely settled until Gauss, in 1838, attacked it analytically, with the aid of the observations accumulated up to his time, and showed that the Earth derives its permanent magnetism almost entirely from sources residing within its own crust, and not, for example, from any system of electric currents circulating around the Earth in the upper regions.

The recent researches of Dr. Schmidt, of Gotha, have confirmed Gauss's conclusion. He finds that about 95 per cent of the Earth's magnetic force is to be referred to causes within its crust and the remainder to electric currents either circulating around the Earth in the upper regions or passing from the air into the earth, and *vice versa*. Some of the periodic and spasmodic variations of the Earth's magnetism, such as the diurnal variation, annual variation (not secular change), magnetic perturbations, according to recent researches by Schuster, von Bezold, Schmidt, Schwalbe, and others, would apparently have to be ascribed to electric currents in the upper regions.

If the way the compass points at various places on the Earth constituted the entire knowledge on the subject, it would be impossible to say whether the compass approximately points northward because of magnetism (or electric currents) within the Earth or external to it. There are, undoubtedly, in the Earth's crust large masses of magnetized and magnetizable substances, as Gilbert inferred from the specimens collected from many parts of the Earth, but modern researches would indicate that the chief source of the Earth's magnetism is not to be referred to permanently magnetized substances, but doubtless to a system of electric currents embedded deep within the interior of the Earth and connected in some manner with the Earth's rotation. In order to make the compass point northward, the electric currents would have to circulate in the interior from east to west, in accordance to the well-known rule of Ampère governing the deflection of a magnetic needle by an electric current. The compass can be made to point north equally as well, however, by electric currents circulating

around the Earth in the upper regions in the contrary direction, viz, from west to east. Therefore with the aid of the compass needle alone it could not be determined whether the currents are inside or outside the Earth.

The dip needle will determine this. The fact that the same end of the compass which points north likewise dips downward in the northern magnetic hemisphere requires, as can be easily shown by applying Ampère's rule, that the electric currents circulate from east to west, and hence, in accordance with the evidence furnished by the compass and the dip needle, the currents must be in the interior of the Earth.

Now, while Gilbert had at his command a general knowledge of the pointing of the compass needle over the regions then traversed, he only had one dip observation to work with—that made by Norman at London in 1576, and doubtless verified by himself. He does not appear to appreciate that it is the salient feature of the dip needle which reveals the fact that the "Earth itself is a great magnet." The citation from Norman's book, page —, shows that by the discovery of the dip Norman had already inferred that the "point respective" which the needle heeds "is rather in the Earth than in the Heavens," and Gilbert in no wise improves upon or adds anything to Norman's reasoning.

To Gilbert the Earth was but a great round lodestone. It had poles and an equator, just as the terrella had its magnetic poles and a natural line or magnetic equator halfway between; it took a definite position in space, just as the terrella did with reference to the Earth; it had its diurnal motion[a] and revolution, just as the terrella had when floated in a bowl of water and brought under the action of the Earth's force; it contained in abundance the very lodestone substance which possessed this remarkable "magnetical virtue;" it magnetized substances just as did the lodestone; it, like the lodestone, attracted bodies to itself (Gilbert regarded gravity and magnetism as identical); therefore, like the lodestone, it was a magnet. All of this reasoning would equally apply for the magnetic effects due to an outside electric field, but in Gilbert's time, though he could distinguish between them, the mutual relationship between electric and magnetic phenomena had not been discovered. He only knew of permanent magnets such as are exhibited in lodestones and artificially made magnets.

According to Gilbert's theory, the Earth's magnetic poles were coincident with the rotation poles; in fact, he regarded the cause of the Earth's rotation as due to magnetic action. The compass, therefore, if it had not been "perverted" in its direction by the attracting influence of the continents, as he thought, would accordingly point true north and south. He persistently regarded the magnetic declination, or, as he termed it, the "variation," as a "sort of perturbation and depravation of the true direction." The Germans, in their term of "*missweisung*," *misdirection*, convey a similar idea. It never entered Gilbert's mind to consider the "variation" as due, in whole or in part, to noncoincidence of magnetic poles and rotation poles, for, were that true, his theory of the Earth as a great lodestone would have fallen to the ground.

He accordingly seeks another explanation, viz, that the "variation" is due to the fact that the elevated and massive parts of the Earth (continents) are more strongly magnetic, and the waters of the globe less so; hence the needle is drawn toward

---

a Gilbert has the credit of being one of the earliest and most ardent advocates in England of Copernicus's theory of the diurnal rotation of the Earth. His magnetic theory of the Earth was in fact largely, if not entirely, advanced in order to furnish a cause for this diurnal rotation.

the continents. He ignominiously fails, however, in this explanation, and apparently ignores facts, undoubtedly known to him, which would have contradicted his theory. He lays himself open here to the same kind of criticism which he so unsparingly heaped upon others.

Apparently aware of the fact that the dip of the needle at London did not correspond to what it ought to have been on the theory that the magnetic poles are at the geographical poles, he speaks of a "variation of the dip," and ascribes this to the same cause as the "variation of the compass." Aware that in the dip the same kind of variations, though not of the same degree as in the magnetic declination, might be expected, he nevertheless proposes a method for determining latitude by means of the dip needle. And yet he ridicules those who had proposed to determine the longitude by means of the magnetic declination.[a]

To conclude, while it must be conceded that Gilbert made the first serious attempt to correlate the magnetic phenomena of the Earth and to construct a theory, his actual and real contributions to the subject of the Earth's magnetism are by no means of that brilliancy and luster which is generally supposed, and which mark his other works, his failures being due in a large degree to his not following his own advice to philosophers, "to leave their books and go out and deal with things." In the writer's estimation, Norman's little work should be given a higher rank as a real and valuable contribution to our advancement of the knowledge of the Earth's magnetism than that part of Gilbert's book dealing with terrestrial magnetism.

THE VARIATIONS OF THE EARTH'S MAGNETISM.

Discovery of the Secular Change of the Magnetic Declination.

The only contribution of great value to the science of terrestrial magnetism in the seventeenth century was the discovery of the secular change of the magnetic declination by Gellibrand in 1634.[b] Hitherto it had been supposed that the magnetic declination, though varying from place to place, was fixed and invariable at any one place, except that "by the break up of a continent," as Gilbert put it, it might suffer a change. But now an entirely new and most important fact came to light, showing indisputably that

[a] The suggestion of determining the longitude at sea by means of the magnetic declination started with Columbus and served to stimulate the making of magnetic observations until the close of the eighteenth century. In 1720 William Whiston, the translator of Josephus, revived Gilbert's idea of using the dip and accordingly supplied certain mariners with dip circles. Thus some notable contributions to terrestrial magnetism were obtained. The earliest dip observation in the United States is that made at Boston in 1722 with a dip circle supplied to Capt. Othniel Beal by Whiston.

[b] Some of the principal writers on magnetism and terrestrial magnetism of the seventeenth century besides Gellibrand were: Barlowe, in whose book, Magnetical Advertisements, 1616, the word "magnetism" as a noun, according to Prof. Silvanus P. Thompson, appears for the first time; Mark Ridley, Bacon, Galileo, Nicolaus Cabaeus, whose Philosophia Magnetica, Ferrara, 1629, the first Italian treatise on the magnet, contains an improvement of Gilbert's picture of the lines of force around a magnet; Kepler, Athanasius Kircher (Jesuit and an opponent of the Copernican theory), who in his works collected all values of the magnetic declination known to him; Descartes, Porta, von Guericke, Hooke, and Bond, who made a special study of the subject of the secular change in the dip, using the word "inclination" to denote the dip in place of the word "declination", which, as will be recalled, Norman had employed.

the earth's magnetism suffers mighty changes in the course of time. Hence it now became necessary to note not only the place but also the time when an observation of the magnetic declination was made. The compass had by this time come into general use, not only as an instrument, as Gilbert said, "beneficial, salutary, and fortunate for seamen, showing the way to safety and to port," but also for the purpose of running out lines on the earth's surface (land surveys) and in mines, and for the orientation of buildings. To retrace these lines anew at some subsequent period required a consideration of the newly discovered fact. No wonder this truth was fought, disputed, and doubted for some time.

Henry Gellibrand was a professor of mathematics at Gresham College. He made a careful determination of the pointing of the compass on June 12, 1634, at Diepford, or Deptford, about 3 miles southeast of London Bridge, and found 4° 6′ east. Now, Edmund Gunter, another mathematician of Gresham College, had found on June 13, 1622, 5° 56½′ east, and, as will be recalled, Borough and Norman had found in 1580, 11° 15′ east. Clearly, therefore, the magnetic declination had suffered considerable change since 1580. Gellibrand repeated his observations, next examined carefully the observations which Borough had published, and although he found that Borough had neglected to take into account atmospheric refraction in his calculations, nevertheless he got practically the same amount as Borough had given.

He announced his discovery in a book,[a] now exceedingly scarce, entitled "A Discourse Mathematical on the Variation of the Magneticall Needle, together with its admirable Diminution lately discovered." London, 1635. He says: "Thus (hitherto according to the Tenents of all our Magneticall Philosophers) we have supposed the variation of all particular places to continue one and the same; so that when a seaman shall happily return to a place where formerly he found the same variation, he may hence conclude 'he is in the same former *longitude*.' For it is the Assertion of *Mr. Dr. Gilbert: Variatio uniuscujusq; Loci constans est*, that is to say the same place doth alwayes retaine the same variation. Neither hath this Assertion (for aught I ever heard) been questioned by any man. But most diligent magneticall obsrvations have plainely offered violence to the same, and proved the contrary, namely that the variation is accompanied with a variation."

He republishes the observations of 1580 and 1622, along with his own, in order to furnish all necessary evidence, and says:

"If any affected with magneticall Philosophy shall yet desire to see an experiment made for their owne particular satisfaction, where I may prevaile, I would advise them to pitch a faire stone parallel to the Horizon there to rest immoveably, and having a Needle of a convenient length strongly touch't by a vigorous Magnet to draw a Magneticall Meridian thereby, and yearly to examine by the application of the same (well preserved from the ayre and rust, its greatest enemies) whether time will produce the like alterations."

Most commendably and remarkably for his times, Gellibrand refrains from "entering into a dispute [speculation] concerning the source of this sensible diminution, whether it may be imputed to the magnet or the Earth, or both," but "must be all

[a] Reprinted in facsimile by Hellmann; Asher & Co., Berlin. Hellmann used a copy loaned him by the late Latimer Clark, whose exceedingly valuable library has come into the possession of the American Institute of Electrical Engineers, headquarters, New York.

left to future times to discover, this Invention being but newly presented to the world in its infancy."

The following sentence, taken from the article on the compass in such an authoritative work as the Encyclopædia Britannica, ninth edition, illustrates the great confusion caused by the misuse of the word "variation:"

"The discovery of the variation of declination was made by Stephen Burrows when voyaging between the north cape of Finmark and Vaigatch (Vaygates), and was afterward determined by Gellibrand, professor of geometry at Gresham College."

In the first case the author means simply the change in the magnetic declination with geographical position, i. e., the geographical variation of the magnetic declination, whereas when referring to the discovery of Gellibrand, the slow variation taking place with the lapse of time, viz, the secular change, is meant. The author has thus used the word "variation" in the same sentence with two totally different meanings, preventing one thereby from getting a proper idea as to the precise facts involved. Besides, the geographical variation of the declination had been discovered in the century previous to that of Burrows's time, as already stated, by Columbus.

Nearly three centuries have passed since Gellibrand's discovery was made known, and although observations have been multiplied and some of the best minds have given their undivided attention to this most striking fact of the Earth's magnetism, the riddle is still unsolved. Innumerable theories have been advanced, the difficulty not being in finding a cause, but to tell which one among the many assignable ones is *the one*. While observations of declination for three centuries are at hand, those of dip are not so numerous and those of the intensity of the magnetic force are still more scarce, beginning only since the third decade of the last century. *Both the dip and intensity undergo secular change in the same manner as the declination.* The definite solution of this great and important problem of the Earth's physics requires a full and accurate knowledge of the changes in the three magnetic elements named. The prospects at present are fair that the secular change of the Earth's magnetism is to be referred, primarily, to the effect of secondary electric currents generated within the Earth by its rotation around an axis not coincident with its magnetic axis.

The Characteristics of the Secular Change.

The secular change has received the closest attention in the United States, largely for practical reasons, as in all of the older States the original land surveys were referred to compass lines. The retracing of the "metes and bounds" at subsequent periods called for a knowledge of the amount of change in the compass bearing during the elapsed interval. To meet the demand for knowledge of this kind, C. A. Schott, who directed the magnetic work of the Coast and Geodetic Survey for nearly a half century, undertook a thorough and systematic collection of all known values of the magnetic declination in the United States and vicinity, resulting in a collection as yet unequaled in any other country.

It is a lamentable fact that such collections have not been undertaken for European countries, where in many instances the records go back to the sixteenth century. Knowledge of the manner and rate of progression of a particular phase of the secular change from place to place would be materially increased thereby.

The following table[a] exhibits how the declination has changed at various places:

TABLE II.—*Showing the secular change in the magnetic declination at various places.*

Year	Northern Hemisphere						Southern Hemisphere			
	London	Paris	Rome	Manila	San Francisco	Baltimore	Rio de Janeiro	Ascension Island	St. Helena Island	Cape Town
	°	°	°	°	°	°	°	°	°	°
1540	7.2 (?) E	8.2 E	10.47 E							
1560	9.6 (?) E	9.3 E	11.61 E							
1580	10.93 E	9.6 E	11.41 E							
1600	10.13 E	8.8 E	9.88 E							
1620	7.26 E	6.9 E	7.29 E							
1640	3.27 E	4.42 E	3.86 E			5.3 W				
1660	0.59 W	0.86 E	0.01 W			6.0 W				
1680	3.89 W	3.47 W	4.01 W			6.1 W				
1700	7.08 W	7.99 W	7.77 W			5.5 W				
1720	10.97 W	12.27 W	11.02 W			4.5 W				
1740	15.30 W	15.83 W	13.63 W			3.2 W				
1760	19.57 W	18.76 W	15.51 W			1.95 W	8.6 E	8.4 W	11.70 W	20.5 W
1780	22.65 W	20.87 W	16.64 W		12.6 E	1.03 W	7.2 E	11.6 W	14.59 W	23.2 W
1800	24.07 W	22.12 W	17.06 W	0.08 E	13.6 E	0.66 W	5.5 E	14.0 W	17.51 W	25.4 W
1820	24.09 W	22.40 W	16.77 W	0.14 E	14.6 E	0.93 W	3.6 E	16.4 W	20.01 W	27.2 W
1840	23.22 W	21.38 W	15.84 W	0.27 E	15.43 E	1.77 W	1.2 E	18.8 W	22.00 W	28.8 W
1860	21.55 W	19.54 W	14.23 W	0.45 E	16.11 E	2.99 W	1.4 W	21.4 W	23.41 W	29.7 W
1880	18.73 W	16.76 W	11.77 W	0.69 E	16.57 E	4.30 W	4.3 W	22.9 W	24.11 W	29.6 W
1890	17.57 W	15.16 W	10.57 W	0.83 E	16.64 E	4.89 W	6.1 W	23.0 W	24.21 W	29.2 W
1900	16.5 W	14.6 W		0.97 E	16.7 E	5.40 W	8.0 W			

This table shows that at London, for example, the pointing of the needle was east of north in the middle of the sixteenth century, reaching a maximum of 11° or 11¼° about 1580. After that it began to diminish until about 1658, the year of Cromwell's death, when the needle stood truly north and south. The needle next began to point westward by an ever-increasing amount until about 1812, when it appeared to almost stand still for several years at a value of somewhat over 24°. Thereafter the westerly declination began to diminish until it is now about 16°. Consequently between 1580 and 1812, in an interval of 232 years, the compass direction at London changed from 11° east to 24° west, in all 35°. *The direction of a street a mile long, laid out in London in 1580 in the direction pointed out by the compass would be seven-tenths of a mile too far to the east at the north terminus according to the compass direction of 1812!*

For Paris and Rome similar changes to those at London are found. At Paris the maximum easterly declination of 9° 36′ was reached near the year 1580, and the maximum westerly declination of 22° 36′ in about 1809, the needle pointing due north in 1664. At Rome the declination of the needle reached its maximum amount east, 11° 36′, in 1570, approximately, and its maximum amount west, 17° 06′, in about 1810, coinciding with the true meridian in 1660. At Manila, Philippine Islands, the needle changed from 05′ east in 1800 to 53′ east in 1901, and at San Francisco, Cal., from 12° 36′ east in 1780 to 16° 48′ east at the present time. At Baltimore, between 1640 and the present time the needle bore west all the time and did not at any time point due

[a] This table and the accompanying subsequent remarks are extracted from the writer's "First report on magnetic work in Maryland," Maryland Geological Survey Report, Vol. I, 1897.

north or east of north as surveyors frequently assumed to be the case for this part of Maryland. The figures show that at Baltimore the compass needle pointed about 6° 06′ west in 1670 and that in about 1802 it pointed the least amount west, namely, 39′; hence, in an interval of 132 years, the needle changed its direction by 5° 27′. *A street a mile long laid out in Baltimore in 1670 so as to run in the compass direction would have its north terminus 504 feet, or about one-tenth of a mile, too far to the west in 1802.* This is a fact especially interesting, because in some of the old towns of the thirteen original States, as for example in Maryland, the streets were laid out by the compass, or prominent public buildings, such as court-houses, were erected so that the front face would run parallel to a cardinal direction as given by the compass. Thus, while establishing a meridian line for the use of surveyors at Chestertown, the county seat of Kent County, Md., it was found that High street, the main street, ran very nearly magnetically northwest and southeast. Assuming that the street was originally laid out with the compass so as to run northwest and southeast, and knowing from the data at Baltimore and some other stations that the needle bore the same amount west in the early part of the eighteenth century that it does at present, the conclusion to be drawn was that the town of Chestertown was laid out in the early part of the eighteenth century. Upon looking up the records, the assumptions made and the conclusions drawn were verified. The town was laid out in 1702 and the streets were run with the compass northwest and southeast, and at right angles thereto. So, also, by determining the astronomical directions of the streets in the old town of Oxford, Md., which had been laid out by the compass in the first decade of the eighteenth century, an approximate knowledge of the magnetic declination at that time was ascertained.

The table likewise gives the change in the compass direction at some stations in the Southern Hemisphere. One fact at once noticeable from this table is, *that during a given interval of time the compass direction changes not only by different amounts in different parts of the Earth, but, likewise, the changes occur in some parts in opposite directions.* For example, compare the changes which have occurred between 1800 and 1890 at the various stations.

Place.	North end of compass needle veered between 1800 and 1890.
London	6° 30′ to the east.
Paris	6 58 " "
Rome	6 29 " "
Manila	0 45 " "
San Francisco	3 02 " "
Baltimore	4 14 " west.
Rio de Janeiro	11 36 " "
Ascension Island	9 00 " "
St. Helena Island	6 42 " "
Cape Town	3 48 " "

The compass needle, accordingly, while swinging to the *eastward* at London between 1800 and the present time was swinging in the opposite direction, *westward*, at Baltimore during the same interval of time, the amount of swing not being the same at the two stations.

Another striking fact disclosed by looking over the figures for any one station, for example, Baltimore, is *that at the same station the change per year is not a constant quantity, as frequently assumed by the surveyor.* The annual change for this particular station

may vary all the way from zero to four minutes. At the times of maximum or minimum values of the declination the annual change is practically zero for about five years on either side of these epochs. The annual change then begins to increase until about midway between the epochs of maximum and minimum values, for example, about 1730 or about 1870, when it reaches its maximum value of about four minutes; it then diminishes again.

The secular motion of the compass needle may be likened to the swinging of a pendulum. At the extreme positions of the pendulum, on either side of the position it would occupy if at rest, the velocity with which the bob moves in its orbital path vanishes. As the pendulum moves toward its mean position from the right, it does so at a constantly accelerating pace until it reaches the mean position midway between the two extreme positions. Here the velocity is a maximum, and as the pendulum swings past the mean position it begins to slacken its pace until reaching the extreme position on the left, when the velocity of motion again vanishes.

At no station has as yet a complete swing—for example, from right to left and back again from left to right—been observed. At some stations, however, a little over half a swing has been obtained. A comparison of the time interval between the two extreme positions, i. e., half a swing, at various stations shows another remarkable fact, *that the time intervals between the extreme positions of the needle are of different lengths in different parts of the Earth.* To illustrate: At London, Paris, and Rome the time interval between dates of extreme positions of the needle is about two hundred and thirty to two hundred and forty years, while for stations in the Eastern States of this country is on the average about one hundred and fifty years.

Taking into consideration all the facts at present known with regard to the secular change, it is found that it is not possible to explain all those facts on the assumption that there is a secular change period common to all parts of the Earth of about three hundred to five hundred years in length. The indications are that for a common secular change period a much longer period is required. But if this is so, it means that the secular change is a far more complicated matter than generally supposed. Besides the main swing as described above, there are a number of minor swings whose periods are not as yet definitely known. These minor swings have the effect of slightly altering the annual change due to the main secular change.

Fig. 8 illustrates graphically the change in the magnetic declination for various points in the Northern Hemisphere, such stations having been selected as would be typical of the regions represented by them. It will be seen that the stations encircle the globe. This one diagram exhibits at a glance all the characteristic features of the secular change of the magnetic declination in the Northern Hemisphere as at present known. With the aid of Table II the meaning of the curves will be readily understood. Thus, for example, selecting the date 1800 and running the eye along the horizontal line marked 1800 until it intersects the London curve, and casting the eye upward from this point of intersection along the vertical line, it is found that the declination of the needle was a trifle over 24° west. For Paris the observations known up to the present time have been indicated by dots. It will be seen that the curve, which is due to Schott, represents the existing data satisfactorily. In the case of Fayal Island it will be noticed that prior to 1600 two curves, one in full and the other broken, are given; the broken curve represents a repetition of the same law which governed the secular change at this station between 1600 and present date, while the

full curve has been drawn to harmonize with the observations back to the time of Columbus. It will be seen that there is a marked difference between the two curves for the date 1500. A similar state of things is revealed at Rome, the broken curve again representing the law from 1510 to present date, while the full curve represents the observations which can be obtained with the aid of the early "compass charts" of the fourteenth and fifteenth centuries. The departure between the broken curve and the full one amounts to about 17° for the year 1400! Similar indications exist at other stations of a change in the law of the secular change prior to 1600.

The special purpose of the diagram has been to show the mutual relationship

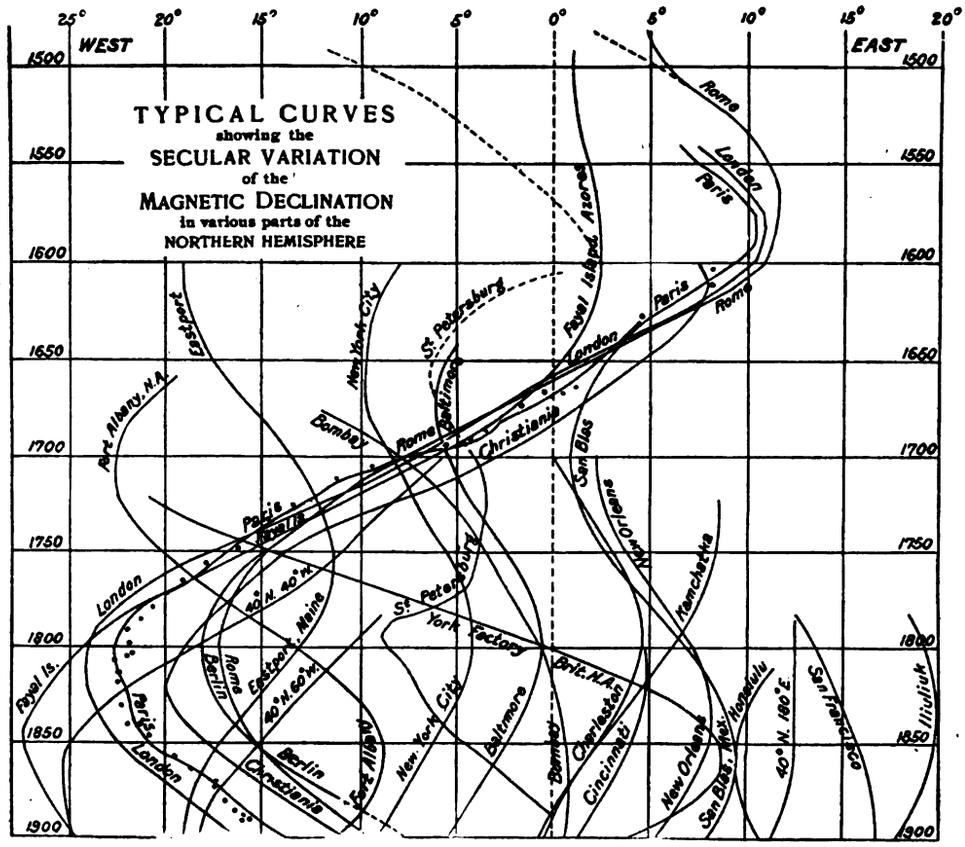


FIG. 8.—Comparison of the secular change curves of the magnetic declination at various stations in the Northern Hemisphere.

between the secular change curves over the Earth. Each station bears a somewhat different testimony of the phenomenon under consideration, and it is only by considering the collective evidence that one can hope to make headway and be enabled to say what probably transpired at any one station prior to the records or what is likely to occur at this station in the future. By following the curves systematically around the globe it is quite possible to construct a composite curve, with the aid of which a clearer conception of this most perplexing phenomenon can be obtained.

However, as already stated, *the laws actually governing the secular change can not be discovered by simply considering the changes in the magnetic declination alone.* One can

hope to make progress only by studying the phenomenon in its *entirety;* that is to say, if a magnetized needle is taken and suspended at its center of gravity in such a way that it is free to turn in any direction whatsoever, to the left or to the right, up or down, then under the influence of the Earth's magnetism the *north* end of the needle, while still pointing approximately toward the north, also points *downward* and the *south* end *upward.* The actual direction assumed by the needle lies somewhere between a true vertical line and a true horizontal line, nearer to the former than to the latter in the latitudes under consideration. This is the direction in which the Earth's magnetic force acts. On the *compass needle* only the *horizontal* component of the force has an effect, as the *vertical* component is counteracted by adding an additional weight to the south arm of the needle, generally a bit of brass wire. The changes that are taking place in the

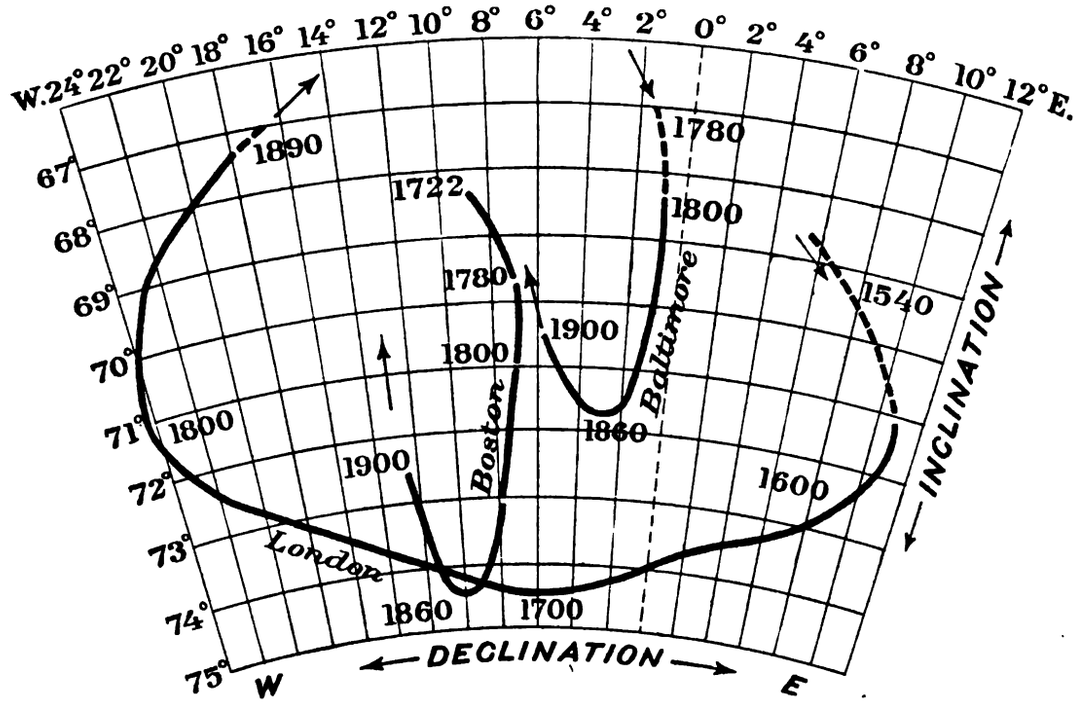


FIG. 9.—Curves showing secular change in magnetic declination and dip at London Boston, and Baltimore.

true direction of the Earth's magnetic force and in its *magnitude* constitute the real facts to be studied.

It is an interesting problem to inquire: How does the north end of the freely suspended magnetic needle move with the lapse of time, if the motion is observed from the point of suspension of the needle? Does it move clockwise or anticlockwise? Would needles similarly suspended in all parts of the Earth move in the same direction? What is the nature of the curve described in space by the north end? These are some of the fascinating questions which can be asked from this point of view.

It has been found by the writer that over the greater portion of the Earth the north end of a freely suspended magnetic needle during the past two or three centuries has been moving in a *clockwise* direction. In the Pacific Ocean and along the western coast of the United States evidence exists of small irregularities in the general law of motion as

explained above. Some of the stations in this region exhibit small *anticlockwise* motions. *No station has thus far been found where the reverse motion has prevailed for any such length of time, as has been the case with the direct motion.*

Fig. 9 exhibits the curves resulting in the manner described above for London, Boston, and Baltimore.

Fig. 10 has been constructed in a similar manner. The outside curve exhibits the changes in magnetic declination and dip encountered were one to make a complete

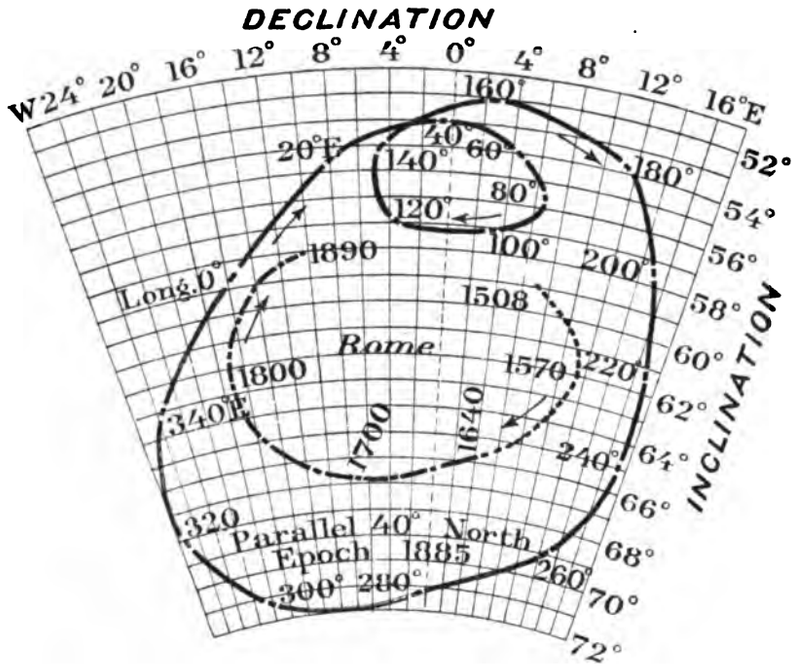


FIG. 10.—Comparison of curve showing change in magnetic declination and dip along parallel of latitude 40° N. in 1885 with curve showing secular change at Rome.

circuit of the Earth in an eastwardly direction along the parallel of latitude 40° north. The data have been scaled from Neumayer's isogonic and isoclinic charts for 1885, contained in his excellent atlas. Thus in zero longitude, counting from Greenwich, a freely suspended magnetic needle pointed in 1885 15½° west and its dip was 58°; in 20° east longitude, these quantities were respectively 8° west and 54°.7, etc. It will be noticed that the curve goes throughout—even for the loop described when crossing Asia—in the same direction as that of the hands of a watch, just as in the case of the secular motion curves shown in fig. 9 and the one of Rome given in the present figure. Rome is situated not far from latitude 40° north, its latitude being 41°.9 north. The general character of the two curves is seen to be very similar. It has been shown in other ways besides this one that many of the laws underlying the momentary distribution of the Earth's magnetism and the secular change are alike.

The circuit of the Earth in the above case was made to the eastward because the secular variation curves appear to develop themselves more and more as we go around the Earth eastwardly.[a]

[a] See Physical Review, Vol. II, pp. 455–465, and Vol. III, pp. 34–48.

Diurnal Variation.

In the year 1682, in the city of Louveau, Siam, it is related that Pater Guy Tachart, in the presence of the King, found that the magnetic declination on one day was 0° 16′ west; on the following day, 0° 31′; on the third day, 0° 35′; on the fourth, 0° 38′, and repeating the observations after the lapse of a few days the values found on three successive days were 0° 28′, 0° 33′, and 0° 21′. The observations were doubtless made on these various days at different times of the day, so that part of the differences in the results obtained are possibly to be ascribed to the next remarkable fact regarding the "constant inconstancies" of the Earth's magnetism, the so-called diurnal variation, by which the needle is made to change its direction, from hour to hour, throughout the day.

The credit of the discovery of the diurnal variation must properly be given to Graham, a London mechanician and clock maker, who from many hundred observations of the declination of the magnetic needle at various times of the day made in 1722 a definite announcement of the existence of this variation.[a] Graham's discovery was later verified and amplified by Prof. Andr. Celsius in Upsala, who had a compass made expressly for this purpose by the instrument maker, Sisson, of London, under Graham's supervision, and by a host of other investigators.

TABLE III.—*The diurnal variation of the magnetic declination at Baldwin, Kans., for each month of the year 1901.*

Hour	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
	′	′	′	′	′	′	′	′	′	′	′	′
1 a. m.	−0.4	−0.2	+0.3	+0.5	+0.3	−0.1	+0.3	+0.1	0.0	−0.1	−0.1	−0.1
2	−0.4	−0.2	−0.2	+0.6	−0.5	+0.2	+0.3	−0.2	0.0	−0.1	−0.2	−0.2
3	−0.2	0.0	−0.2	+0.5	−0.6	−0.4	+0.4	+0.1	−0.3	+0.2	−0.1	−0.2
4	−0.1	+0.2	−0.4	+0.8	−0.8	−0.8	+0.8	−0.3	+0.8	+0.2	0.0	0.0
5	−0.5	+0.4	−0.4	+0.9	−1.4	−1.4	+1.4	+1.2	+1.1	+0.4	+0.2	−0.2
6	−0.3	+0.3	+0.8	+1.6	−2.2	+2.4	+2.4	+2.7	+2.3	+0.8	+0.3	−0.2
7	0.0	+0.9	−1.9	+2.7	−3.1	−3.5	+3.6	+4.2	**+4.0**	+2.0	+1.2	−0.3
8	+0.6	+1.5	+2.5	**+3.5**	**−3.3**	**+3.7**	**+4.0**	**−4.4**	+3.6	**+2.6**	+2.0	+0.4
9	−1.5	**+2.2**	**−2.7**	+2.8	+2.8	+3.2	+3.4	+3.3	+2.4	+2.4	**+2.0**	+1.2
10	**−2.0**	+1.3	+1.8	−1.1	−1.0	+1.0	+0.9	+0.3	0.0	+1.0	+1.0	**+1.4**
11	+1.1	+0.1	−0.2	−0.8	−1.1	−1.2	−1.7	−2.2	−2.2	−0.8	−0.6	−0.6
Noon	−0.4	−1.2	−2.0	−2.1	−2.4	−2.6	−3.2	−3.7	−3.6	−2.2	−1.7	−0.7
1 p.m.	−1.3	−1.8	−3.0	−3.1	−3.4	−3.5	−4.0	**−4.3**	**−3.8**	**−2.5**	**−2.1**	−1.5
2	**−1.6**	**−2.0**	**−3.0**	**−3.5**	**−3.7**	**−3.7**	**−4.1**	−4.1	−3.0	−2.1	−1.8	**−1.6**
3	−1.4	−1.6	−2.5	−3.0	−2.8	−2.9	−3.1	−3.0	−1.5	−1.4	−1.1	−1.3
4	−1.1	−0.9	−1.5	−2.0	−1.8	−1.8	−1.9	−1.3	−0.4	−0.7	−0.5	−0.7
5	−0.3	−0.3	−0.5	−1.0	−0.8	−0.6	−0.7	0.0	+0.1	−0.4	−0.1	+0.1
6	−0.2	0.0	−0.1	−0.3	−0.1	−0.1	+0.2	+0.5	−0.2	−0.2	+0.1	+0.4
7	+0.5	+0.2	−0.1	0.0	−0.2	0.0	+0.2	+0.2	−0.1	+0.2	+0.4	+0.5
8	+0.6	+0.4	+0.1	0.0	−0.1	0.0	+0.2	+0.1	+0.2	+0.2	+0.4	+0.6
9	+0.6	+0.5	+0.4	0.0	−0.1	0.0	+0.2	+0.2	+0.4	+0.3	+0.4	+0.6
10	−0.5	+0.2	+0.5	+0.2	0.0	−0.1	+0.2	+0.3	0.0	+0.2	+0.1	+0.4
11	+0.4	+0.2	+0.4	+0.2	+0.1	0.0	+0.2	+0.3	0.0	+0.2	+0.1	+0.2
Mid't	+0.1	0.0	+0.3	+0.6	+0.2	−0.1	+0.1	+0.3	−0.3	0.0	0.0	−0.1
Range	3.6	4.2	5.7	7.0	7.0	7.4	8.1	8.7	7.8	5.1	4.1	3.0

[a] See "Philosophical Transactions," London, 1724.

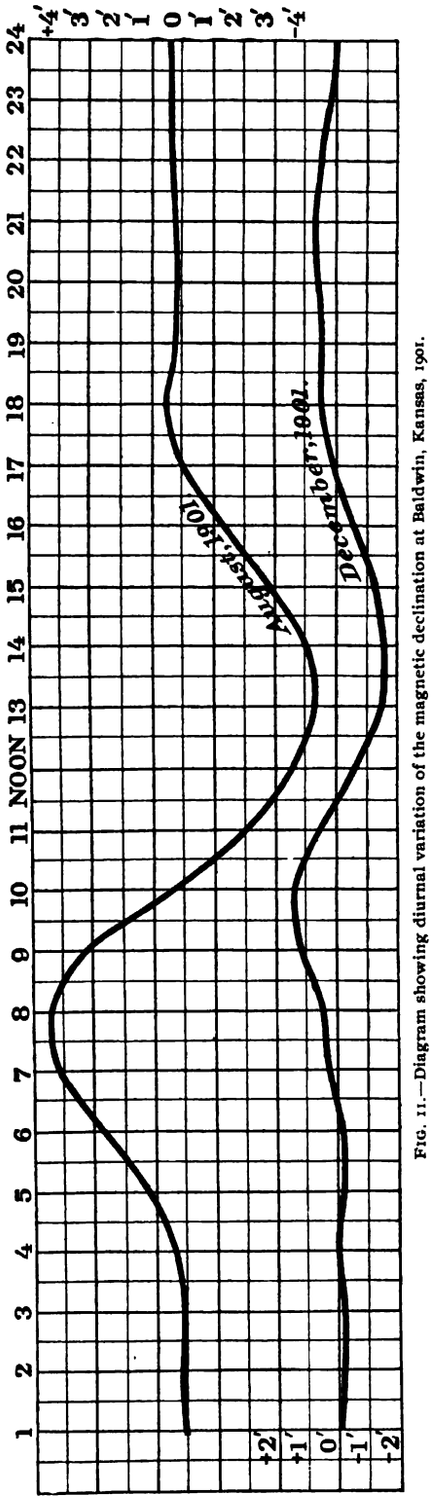


FIG. 11.—Diagram showing diurnal variation of the magnetic declination at Baldwin, Kansas, 1901.

Table III shows how the compass needle changed its direction from hour to hour (local mean time) for each month of the year 1901 at Baldwin, Kans., where the Coast and Geodetic Survey has a magnetic observatory in which are mounted delicate instruments registering continuously, day and night, automatically, by photographic means, the minutest variations in the Earth's magnetism.

At that place the magnetic needle points about 8°.4 east of north. A plus sign in the table means a deflection of the needle toward the east of the average direction for the entire day (twenty-four hours), and a minus sign a deflection toward the west. Thus in August, for example, at 8 a. m. the average easterly pointing of the needle was increased by 4'.4; it then began to diminish until the average value was reached a little after 10 a. m., indicated by the change of sign of the tabular quantities; after passing this point it still continued to diminish until reaching its lowest value at about 1 p. m., when the easterly declination had its least value, being 4'.3 less than its average value, or about 9' less than its maximum value in the morning. Next it increased until again reaching its average value about 5 p. m., after which it remained nearly stationary, except for minute fluctuations throughout the night, until about sunrise, when it rapidly began to rise to its maximum value.

Examining the figures for a winter month, e. g., December, it will be seen that the fluctuations are not so large as during the summer; where before the difference between maximum and minimum was about 9', it is now one-third of this amount, viz, 3'. On the diagram, Fig. 11, the diurnal variation of the magnetic declination for the two months, August and December, has been graphically represented.

Two lines, each a mile long, one run in the direction indicated by the compass early in the morning and the other early in the afternoon, both starting at the same point, diverge at their extremities in midsummer by 10–15 feet, the morning line being to the east of the afternoon one; in midwinter the divergence would be about one-third of this amount. It will thus be seen

that the diurnal variation is of sufficient importance to be taken into account in accurate land surveys.

In Germany mine surveying has become such an art that some of the principal mines maintain small magnetic observatories, where the declination is recorded continuously throughout the day by photographic means. The mine surveyor then uses the value of the declination to the nearest minute prevailing at the time of day when he is running his line.

Where the needle points west of north, the times of maximum and minimum value of the magnetic declination will be reversed from what they are at Baldwin, the minimum occurring in the morning and the maximum in the afternoon. Of the two lines a mile long, considered above, the morning line will, however, again be east of the afternoon line.

The times when the declination reaches its extreme values, or when it reaches its average value, as is evident from Table III, are subject to fluctuations in the course of the year, being retarded during the months when the sun is south of the equator. These changes, which undergo a complete cycle in the course of one year, likewise manifest themselves in the magnitude of the diurnal range, approximately shown by the figures given in the bottom line of the table.

The approximate local mean time when the average declination is reached, in the United States is, on the average for the year, at about 10:30 a. m., and again about about 6 p. m. (See next table.)

The following comparative table, No. IV, of the diurnal variation was prepared by Schott[a] in order "to exhibit the changes which the total solar-diurnal variation undergoes with a change of geographical position within the region of North America." The series of observations which he admitted "extend over one or more years, and in no instance have any so-called disturbances been excluded." "The year or years of each series is added to admit of a correction for position in the sun-spot period."

The particulars for each station are as follows:

Name	Latitude	Longitude W. of Gr.	Magnetic Dip	Diurnal Range of Declination	Extent of series
	° ′	° ′	° ′	′	
Key West, Fla.	24 33.1	81 48.5	54 32	4.7	Mar., 1860, to Mar., 1866, exclusive
Los Angeles, Cal.	34 03.0	118 15.4	59 30	5.8	Oct., 1882, to Oct., 1889, exclusive
Washington, D. C.	38 53.6	77 00.6	71 19	7.5	July, 1840, to June, 1842, inclusive
Philadelphia, Pa.	39 58.4	75 10.2	71 58	7.8	Jan., 1840, to June, 1845, inclusive
Madison, Wis.	43 04.5	89 24.2	73 56	6.7	Mar., 1877, to Mar., 1878, exclusive
Toronto, Canada	43 39.4	79 23.5	75 15	8.8	July, 1842, to June, 1848, inclusive
Sitka, Alaska	57 02.9	135 19.7	75 55	10.6	Irregular series, 1848 to 1862
Uglaamie, Point Barrow	71 17.7	156 39.8	81 24	40.1	Sept., 1882, to Aug., 1883, inclusive
Plover Point, Point Barrow	71 21.4	156 16.1	81 36	38.6	17 months, 1852–1854
Fort Rae, Great Slave Lake	62 38.9	115 13.8	82 54	41.4	Oct., 1882, to Sept., 1883, inclusive
Kingua Fjord, Cumberland Sound	66 35.7	67 19.2	83 51	43.7	Do.
Fort Conger, Grinnell Land	81 44.0	64 43.8	85 01	98.8	Sept., 1881, to Aug., 1882, inclusive

[a] See Appendix No. 9, Coast and Geodetic Survey Report for 1890, pp. 261–264.

TABLE IV.—*Total solar-diurnal variation of the magnetic declination, on the yearly average, at prominent places in North America.*

[A + sign indicates a deflection of the north-seeking end of the magnet toward the *east*, a − sign the contrary direction.]

Local mean time.	1. Key West, Fla.	2. Los Angeles, Cal.	3. Washington, D.C.	4. Philadelphia, Pa.	5. Madison, Wis.	6. Toronto, Canada	7. Sitka, Alaska	8. Uglaamie, Point Barrow	9. Plover Point, Point Barrow	10. Fort Rae, Great Slave Lake	11. Kingua Fjord, Cumberland Sound	12. Fort Conger, Grinnell Land	Average values, stations 1 to 6, inclusive
	′	′	′	′	′	′	′	′	′	′	′	′	′
1 a. m.	+0.0	+0.0	+0.7	+0.6	+0.1	+0.6	+0.2	−12.8	− 8.0	−11.0	+11.7	+43.2	+0.35
2 a. m.	−0.0	+0.1	+0.7	+0.5	0.0	+0.5	+1.0	− 4.9	− 1.9	− 6.6	+15.8	**+45.1**	+0.05
3 a. m.	+0.1	+0.2	+0.9	+0.6	+0.2	+0.8	+1.4	+ 3.3	+ 3.6	+ 0.8	+18.0	+41.2	+0.07
4 a. m.	+0.2	+0.3	+1.2	+1.0	+0.5	+1.2	+2.0	+ 6.2	+10.9	+ 7.4	+19.1	+25.7	+0.75
5 a. m.	+0.4	+0.6	+1.7	+1.5	+1.0	+1.8	+2.9	+14.3	+16.6	+13.6	+19.3	+31.6	+1.19
6 a. m.	+1.0	+1.3	+2.1	+2.1	+1.4	+2.7	+4.2	+21.6	+19.3	+21.0	**+20.1**	+19.7	+1.79
7 a. m.	+2.1	+2.4	+2.8	+3.3	+2.6	+3.5	+5.3	+26.1	**+27.1**	+26.2	+19.9	+26.6	+2.80
8 a. m.	**+2.5**	**+3.1**	**+3.2**	**+3.5**	**+3.2**	**+3.8**	**+6.0**	**+26.7**	+27.0	**+29.4**	+17.4	+18.7	**+3.24**
9 a. m.	+2.2	+2.6	+2.3	+2.8	+3.0	+3.0	+5.3	+26.1	+19.9	+25.5	+10.8	+ 1.2	+2.67
10 a. m.	+1.1	+1.1	+0.9	+0.8	+1.7	−0.8	+3.0	+ 9.9	+ 9.3	+16.8	+ 3.7	−12.7	+1.09
11 a. m.	−0.2	−0.8	−1.3	−1.6	−0.7	−2.0	+0.6	+ 1.4	− 0.4	+ 8.0	+ 1.3	−21.4	−1.08
Noon	−1.4	−2.2	−3.2	−3.4	−2.5	−4.2	−2.1	− 5.9	− 8.2	− 0.9	− 9.0	−40.7	−2.80
1 p. m.	−2.1	**−2.7**	**−4.3**	**−4.3**	**−3.5**	**−5.0**	−3.2	− 7.3	−10.7	− 4.0	−15.1	−45.6	**−3.63**
2 p. m.	**−2.2**	−2.6	**−4.3**	−4.1	**−3.5**	−4.8	−4.2	− 7.7	− 9.8	− 8.1	−21.2	−49.2	−3.56
3 p. m.	−1.9	−2.0	−3.5	−3.1	−2.6	−3.8	**−4.6**	− 7.3	− 9.9	−10.6	−20.4	−45.8	−2.80
4 p. m.	−1.3	−1.1	−2.5	−2.2	−1.6	**−2.5**	**−4.6**	− 9.1	− 9.8	−11.3	−20.6	**−53.7**	−1.85
5 p. m.	−0.8	−0.5	−1.5	−1.0	−0.7	−1.3	−3.8	− 9.9	−10.2	−12.1	**−23.6**	−23.7	−0.95
6 p. m.	−0.4	−0.2	−0.8	−0.4	−0.2	−0.3	−3.2	− 9.9	− 9.7	−12.9	−19.4	−17.3	−0.36
7 p. m.	−0.2	−0.0	0.0	+0.0	+0.2	+0.2	−2.4	− 8.4	− 8.4	−12.5	−16.1	−27.2	+0.05
8 p. m.	+0.1	+0.1	+0.6	+0.8	+0.2	+0.7	−1.4	− 6.0	− 9.0	−11.0	−15.5	− 3.5	+0.44
9 p. m.	+0.2	+0.1	+1.0	+0.6	+0.6	+1.2	−0.8	− 8.1	− 7.5	−12.0	− 8.8	+ 3.5	+0.64
10 p. m.	+0.2	+0.1	+1.1	+1.2	+0.7	+1.3	−0.4	−10.9	− 7.9	−11.9	− 0.6	+22.4	+0.79
11 p. m.	+0.2	+0.1	+1.1	+0.7	−0.2	+1.2	−0.6	− 9.1	**−11.5**	−11.9	+ 3.9	+30.0	+0.60
Midnight	+0.1	+0.0	+1.0	+0.6	+0.1	+0.8	−0.6	**−13.4**	−10.8	**−12.0**	+ 9.2	+32.6	−0.45
Range	4.7	5.8	7.5	7.8	6.7	8.8	10.6	40.1	38.6	41.4	43.7	98.8	6.9

Schott's deductions from this table are:

"A perusal of the tabular values for the localities marked 1 to 6, and which represent all that part of the United States and Canada which lies south of the forty-ninth parallel, shows a very close accord of the diurnal variation, having an average maximum easterly deflection of 3′.2 at about $7^h.9$ in the morning and an average maximum westerly deflection of 3′.6 at about $1^h.4$ in the afternoon, although the dip varies 20¾° between these geographical limits. At Sitka the range reaches already 10′.6 and beyond, with a dip of 80° and more, the diurnal range rapidly rises, attaining 1° 40′ nearly at Fort Conger. At the higher (magnetic) latitude stations there is a tendency to shift the morning extreme to an *earlier* hour and the afternoon opposite extreme to a later hour than the corresponding times just cited. A remarkable feature in the diurnal variation (yearly average) is the close correspondence in the local times when the needle passes the average magnetic meridian (tabular values passing from + to − sign); these times are:

	h	m
For Key West	10	51
Los Angeles	10	35
Washington	10	25
Philadelphia	10	20
Madison	10	43
Toronto	10	17
Average	10	32

"This time is subject to an annual inequality which at Los Angeles in the summer months displaces it to about $10^h\ 00^m$, and in the winter months to about $11^h\ 30^m$."

The diurnal range of the magnetic declination as is seen in Table IV, increases with an approach to the magnetic pole and decreases toward the magnetic equator. If d represents the diurnal range, I, the dip and ϕ, the "magnetic" latitude as found from the formula $\tan \phi = \frac{1}{2} \tan I$, then the following formula:

$$d = 2'.58 \sec^2 \phi$$

will give a fair representation of the law according to which the diurnal range varies with magnetic latitude or dip.

The diurnal range increases with an approach toward the magnetic pole because the horizontal component of the magnetic force, which holds the compass needle in place, diminishes with a movement in this direction, whereas the deflecting forces which cause the diurnal variation increase, and thus their effect increases with increase of magnitude latitude. The only force acting on the compass needle at the magnetic pole is that due to the diurnal variation, and to magnetic perturbations, so that, if the needle were suspended with sufficient delicacy it might pass back and forth through all points of the compass in the course of the day.

The average value, for the year, of the diurnal range is subject to a mysterious fluctuation, being greater in years of maximum frequency of sun spots, and less in times of minimum frequency or minimum solar activity as exhibited by sun spots. The next table, V, shows this. The numbers in column R, due to Wolf, represent the variation for the years given in the sun-spot frequency. Thus in the year 1843, a minimum sun-spot year, it is found that the range of declination at Philadelphia reached its smallest value. The period 1883–1884 was a maximum sun-spot year, and it is seen that the range at Los Angeles reached its maximum value during this time.

TABLE V.—*Showing how the diurnal range of the magnetic declination varies during the sun-spot period—(about 11 years).*

Philadelphia			Los Angeles		
Year	d Diurnal range of declination	R Relative sun-spot frequency numbers	Year (Oct. to Oct.)	d Diurnal range of declination	R Relative sun-spot frequency numbers
	′			′	
1840	9.1	61.8	1882–83	6.5	60.7
1841	8.1	38.5	1883–84	**7.1**	**68.2**
1842	7.8	23.0	1884–85	6.9	53.7
1843	**7.5**	**13.1**	1885–86	5.8	32.4
1844	7.5	19.3	1886–87	5.4	14.3
1845	8.5	38.3	1887–88	5.4	7.3
			1888–89	5.1	7.4

According to the researches of two Russians, Leyst and Passalskij, the diurnal variation is different over locally disturbed areas, e. g., in regions of iron mines, from what it would be if the disturbances did not exist. Hence in such regions, the continuous records of distant magnetic observatories can not be utilized for referring the magnetic elements to the mean value for the day, or to some other period of time, but, special observations for this purpose must be made in the disturbed locality. Whether the secular change is likewise different over locally disturbed regions from what it would be if the local disturbance were not present, is not yet known.

Just as the declination suffers change from hour to hour throughout the day, so likewise are the other elements of the Earth's magnetism, the dip and the intensity, affected.

The diurnal variation, as has been shown, progresses according to the hours of local mean time, or, in other words, is connected in some manner with the Earth's rotation whereby different parts of its surface are exposed to the action of the Sun's rays, and it may be presumed, therefore, that the Sun plays a prominent part in causing the daily variation in the Earth's magnetic state. The precise manner in which the Sun brings about this variation has not yet been satisfactorily explained in spite of the researches of the most eminent investigators. The most commonly accepted opinion is that the diurnal variation is due to a peculiar system of electric currents in the upper regions of the atmosphere, the precise way in which their existence is brought about not being, however, as yet clear.[a]

The diurnal variation furnishes the first evidence that the Earth's magnetism is in close touch with outside influences and responds in a most mysterious and sympathetic manner with changes ever going on in the upper regions. The facts related in the following pages give further evidence on this subject.

Annual Variation.

If the monthly values of the magnetic declination be corrected for the secular change in the course of the year, they exhibit a slight variation, having the year as the period, known as *the annual variation of the magnetic declination*. This is not to be confounded with the *annual change* of the declination, which means the change in one year due to the secular variation. The latter is a *progressive* change, so that the needle at the end of the year does not point the same way that it did at the beginning, while the annual variation is a *cyclical* change, that is, as far as the annual variation is concerned, the needle returns to the same position virtually at the end of the year that it had at the beginning. The next table shows how minute a quantity this annual variation is, and that it can be neglected for all practical purposes.

[a] The reader who is interested in the latest theoretical developments might be referred to Schuster's paper in Phil. Trans. R. S., Part A, 1889; von Bezold's papers, Berlin Academy of Sciences, 1897, and Nippoldt's papers, Terrestrial Magnetism, Vol. VII. A summary of Schuster's and von Bezold's researches will be found in Gray's Magnetism and Electricity, Vol. I, 1898.

TABLE VI.—*Annual variation of the magnetic declination at several places in the northern magnetic hemisphere.*[a]

[A + sign denotes a deflection of the north end of the magnet to the *eastward*, a − sign, the contrary direction.]

Month	Los Angeles, Cal. 1882–1889	Key West, Fla. 1862–1865	Washington, D. C. 1840–1842, 1867–1868	Philadelphia, Pa. 1840–1845	Toronto, Canada 1845–1851, 1856–1864, 1865–1871	Dublin, Ireland 1841–1850	Kew, England 1858–1862
	′	′	′	′	′	′	′
January	+0.6	−0.6	+0.6	−0.5	0.0	+0.4	0.0
February	+0.2	−0.6	+0.3	−0.4	+0.2	+1.6	−0.6
March	−0.4	+0.1	+0.2	+0.1	+0.1	+1.7	−0.5
April	−0.4	+0.3	−0.1	+0.1	0.0	+1.9	0.0
May	−0.4	+0.3	−0.4	−0.2	+0.3	+1.3	+0.7
June	−0.4	+0.2	−0.1	+0.6	+0.5	0.0	+0.8
July	−0.4	+0.3	+0.2	+1.0	+0.4	−1.2	+1.2
August	−0.1	+0.8	+0.7	+0.9	0.0	−2.2	+0.3
September	+0.3	+0.7	−0.4	0.0	−0.4	−2.1	−0.2
October	+0.4	−0.5	−0.2	+0.2	−0.6	−1.4	−0.8
November	+0.5	−0.5	−0.2	−0.9	−0.4	−0.3	−0.6
December	+0.6	−0.3	−0.3	−0.7	−0.1	+0.2	−0.7

It is seen that the total range of the annual variation is a very small quantity, about 1′ for the North American stations. The character of the variation appears to be different for each station. This may possibly be because the tabular results do not refer in each case to the same interval of time, and because they were not deduced by one common method.

According to the recent investigations of Dr. Schwalbe, the forces which bring about this variation are situated outside the earth.

MINOR PERIODIC FLUCTUATIONS.

Chief among these may be mentioned the variation depending upon the position of the Moon with reference to the Sun and the Earth. The range, or difference between the extreme values, of this variation is so minute that it has required many years of continuous and carefully made observations to detect it.

MAGNETIC STORMS.

Generally speaking these may occur at any time and are frequently accompanied by auroral displays. Such storms may at times have a very wide circle of action and occur practically simultaneously over the whole area. Thus on December 3, 1896, while the writer was on his way to Salisbury, Md., to make magnetic observations, he saw a most brilliant aurora, and the next day while making magnetic observations the behavior of the needle indicated that a magnetic storm was prevailing. This storm it was afterwards ascertained occurred at foreign observatories practically simultaneously with its occurrence in Maryland.

The fluctuations caused by these spasmodic variations in the Earth's magnetism may in the United States occasionally amount to as much as 10–20′ and even more.

[a] From Coast and Geodetic Survey Report for 1890, p. 249. The matter contained in Tables IV and V was taken from the same source.

Thus, on October 12, 1896, the writer made observations at Oakland, Md., at various times during the day. The diurnal variation on that day was completely reversed, the maximum value of west declination occurring in the morning instead of in the afternoon, and the minimum value in the afternoon instead of the morning. The observation in the morning required a correction of $-16'$.

Small, spasmodic fluctuations occur frequently; in fact, scarcely a day passes without them.

It is due largely to these irregular disturbances, the coming of which can not be predicted, that it is not possible to give by a general system of rules accurate reductions of an observed declination to the mean value for the day.

The duration of the irregular fluctuations may be but an instant, a few hours, or several days. They generally reveal their presence by a sudden and marked departure of the needle from its true normal position. While these fluctuations make their appearance apparently at random, nevertheless when they are treated statistically it is found that they exhibit well-marked periodicities in their occurrences. They are more frequent and more violent in the years of maximum solar activity, as indicated by sun spots, and less frequent and less violent in years of minimum activity. In November, 1882, near the period of maximum sun spots, a magnetic storm occurred which caused the magnetic needle at Los Angeles, Cal., to move over $1\frac{1}{3}°$ out of its normal position. There was at the time a brilliant auroral display. This storm occurred over the entire Earth, at Los Angeles, Toronto, London, St. Petersburg, Bombay, Hongkong, and Melbourne, and began at practically the same instant of absolute time. Then again they appear subject to short, spasmodic variations, such as the daily and the annual. They apparently occur more frequently toward evening and less frequently toward noon; also more frequently in equinoctial months and less frequently in solstitial months. Perhaps a good idea of the frequency and magnitude of the irregular disturbances is obtained from Schott's table,[a] based on the observations made every two hours at Philadelphia, under Bache, between the six years 1840 to 1845.

Deviations from normal direction.	Number of disturbances.
′ ′	
3. 6 to 10. 8	2189
10. 8 to 18. 1	147
18. 1 to 25. 3	18
25. 3 to 32. 6	3
Beyond,	0

It should be recalled that the period of minimum sun-spot activity occurred in the midst of this series; otherwise the disturbances would have been more frequent and greater. Schott cites the following maximum deflections:

	°	′
At Key West, between 1860 and 1866	0	21.4
At Madison, Wis., on May 28, 1877	0	24
At Madison, Wis., on October 12, 1877	0	48
At Lady Franklin Bay, during great storm in November, 1882, Greely noted a deflection of	20	28

[a] Coast and Geodetic Survey Report for 1888, App. 7.

G. R. Putnam, of the Coast and Geodetic Survey, cites a change of over 3° in twenty minutes at Niantilik on September 18, 1896. "At 7^h 35^m a. m. local mean time, the needle pointed 60° 35′ west of north, while at 7^h 55^m, it pointed 63° 50′ west of north, and the total range for the day was over 4½°. On this date there was an unusual magnetic disturbance, the extreme range in declination at Washington being 38′ for the entire day, and 19′ for the portion of the day corresponding to the interval during which observations were made at Niantilik. It will be noted that the range in declination was nearly fifteen times as great as at Washington during the same interval." The geographical position of Niantilik is 64° 53.′5 north and 66° 19.′5 west of Greenwich, and the dip on September 18, 1896, was 83° 54.′8.

Some other interesting cases of magnetic storms will be given in the section on "Magnetic Observatories."

The cause of these remarkable phenomena of the Earth's magnetism whereby the whole magnetic system of the Earth is deranged at a moment's notice is shrouded in mystery. There are clearly three kinds of magnetic storms: (1) Cosmic ones, due to changes occurring in the regions above; (2) telluric ones, resulting from changes within the interior of the Earth, and (3) regional or local ones, resulting from changes within or external to the Earth's crust, whose field of action is limited to a restricted region of the Earth and the center or focus of which, while sometimes stationary, generally travels from place to place.

The principal phases of a storm of the first kind occur simultaneously over the Earth, within one or two minutes of time. Doubtless if arrangements could be made to time these principal phases at places over the entire Earth with greater accuracy than the ordinary photo-magnetic records will admit of, the correspondence in time would be only a matter of seconds. During the prevalence of these magnetic storms strongly marked variations in the electric currents within the Earth's crust manifest themselves along with the variations of the magnetic needle. Lord Kelvin has calculated the amount of energy required to produce the magnetic storm of June 25, 1885, if it were to be referred to direct action of the sun. Quoting from Gray's Magnetism and Electricity:

"The horizontal force at the following eleven places: St. Petersburg, Stonyhurst, Wilhelmshaven, Utrecht, Kew, Vienna, Lisbon, San Fernando, Colaba, Batavia, and Melbourne, increased considerably from 2 to 2.10 p. m., and fell from 2:10 to 3 p. m., with irregular changes in the interval.

"The mean value at all these places was .0005 above par at 2:10 and .005 below par at 3 p. m. The changes as shown by the photographic records were simultaneous at the different places. Assuming these electrical oscillations of the Sun, Lord Kelvin estimates that the electrical activity of the Sun during the storm, which lasted about eight hours, must have been about 160×10^{24} horsepower, or about 12×10^{35} ergs per second; that is, about 364 times the activity of the total solar radiation, which is estimated at about 3×10^{33} ergs per second. The electrical energy thus given out by the Sun in such a storm would supply, if transformed to the electrical vibrations of shorter period concerned in its ordinary radiation, the whole light and heat radiated during a period of four months. This, as Lord Kelvin remarks, is conclusive against the hypothesis that these violent magnetic disturbances are due to direct action of the Sun."

The probability is that a solar ray endowed with greater or less energy than ordinarily and of the necessary kind acted as the "trigger to the gun" to set off mighty electric forces whose presence in the upper regions is becoming more and more manifest every day.

A magnetic storm of the second category is associated with changes within the Earth, cataclysms, earthquakes, volcanic outbreaks, etc. The phases may occur simultaneously over very large portions of the Earth, or progress from place to place according to a certain rate. Remarkable coincident effects observed during the May eruption in Martinique will be found further on. Hansteen declared "that the variations of the magnetic needle are a mute language revealing to us the changes perpetually going on in the interior of the Earth." Another great student of nature, Clerk Maxwell says: "The never-resting heart of the Earth traces in telegraphic symbols the record of its pulsations, and also the slow but mighty working of the changes which warn us not to suppose that the inner history of our planet is ended."

Magnetic disturbances of the third kind, as stated, take place over a limited area, and are associated with phenomena occurring within the Earth, as enumerated in the previous paragraph, or with phenomena in the upper regions. In the case of these storms the passing of the principal phases from place to place may take a measurable amount of time. Storms of the first and second kind may bring about storms of the third kind as secondary phenomena.

Dr. Schmidt made a mathematical analysis of various magnetic storms, and in particular of the one which occurred on February 28, 1896, and whose course was followed one hour, from 6 to 7 p. m., Greenwich time, at the suggestion of Professor Eschenhagen, simultaneously by 15 observatories distributed over the Earth. His investigations clearly showed that the disturbance vectors at times converged to a point, at other times radiated from a point, and in times of magnetic calms (comparatively speaking) the vectors at the various stations were almost parallel to each other, as though pointing to a distant force center; furthermore, that the points of convergence in general moved progressively forward with a velocity of about 1 kilometer in a second, and also that they were at times nearly stationary. In view of the fact that the cause of the diurnal variation of the Earth's magnetism must apparently be referred to electric currents in the upper regions of the atmosphere, Dr. Schmidt believes that the immediate cause of the magnetic storms is to be referred to electric whirls or vortices which separate themselves from the general electric field in the atmosphere just as do the cyclones and anticyclones known to meteorologists. Taking also into consideration the vertical disturbing components and applying Ampere's rule to the current systems revealed by the disturbing forces, it follows that for the greater part of our observed magnetic storms the causes come from the outside of the Earth's crust.

MAGNETIC OBSERVATORIES.

These institutions are designed especially to secure a record of the changes ever going on in the magnetic condition of the Earth. It was recognized at an early date that the problems of terrestrial magnetism, like those of meteorology, have a world-wide interest and bearing, and so require for their successful and complete solution the united and harmonious efforts of all nations.

FIG. 12.—COAST AND GEODETIC SURVEY MAGNETIC OBSERVATORY AT CHELTENHAM, MARYLAND.

Under the powerful initiative of von Humboldt, Gauss, Herschell, Kupffer, and Sabine, a number of institutions were accordingly established in the fourth decade of the last century in different parts of the Earth, whose special purpose it was to record the ever-occurring magnetic variations. To cooperate with these foreign observatories a magnetic observatory—due to the enthusiasm of Professor Bache—was founded in this country at Girard College, Philadelphia. The results from these observatories amply showed the wisdom of international cooperation. At the present time a special effort at a systematic study of the magnetic variations, according to a uniform plan, has again been originated, this time in cooperation with the various Arctic and Antarctic expeditions.

The Coast and Geodetic Survey has at present four magnetic observatories taking part in this international work, viz, at Cheltenham, Maryland, 17 miles southeast of Washington; at Baldwin, Kansas, 17 miles south of Lawrence; at Sitka, Alaska, and in the Hawaiian Islands, at a site about 14 miles west of Honolulu. The first named, the Cheltenham Observatory, is one of the most complete and elaborately constructed magnetic observatories in existence, and its scope of work will include, besides the observation of magnetic phenomena, also seismic ones, and such as are related to atmospheric and to telluric electricity.

The next illustration, Fig. 12, gives a view of the Cheltenham Magnetic Observatory, the larger building being the so-called "Variation Observatory," in which are mounted the self-registering photo-magnetic instruments, and the smaller building containing the office in the middle, flanked by two wings in which the absolute magnetic observations are made. The Variation Observatory consists of two rooms, each 16 by 19 feet; in the north room is mounted a magnetograph of the Eschenhagen pattern, and in the south room has been installed the Adie magnetograph, adapted for photographic registration and for eye readings, formerly at Los Angeles (1882–1889) and at San Antonio (1890–1895).

As the variations in the intensity of the magnetic force recorded on magnetic instruments are partly due to the changes in the magnetic moment of the suspended magnets due to temperature changes, it is necessary to either provide some means for determining these artificial changes and make corrections, or to institute the necessary arrangements for preserving a constant temperature in the observing room.

In the case of the Cheltenham Observatory, the attempt has been made to secure in an above-ground structure freedom from moisture and a uniformity of temperature within certain practical limits without employing any other means than that derived from the insulation of the specially constructed walls of the variation observatory building. In addition, thermographs register continuously any remaining temperature fluctuations inside the magnetograph rooms, with the aid of which any necessary reductions of the magnetic intensity variations to a selected standard temperature can be made. The drawing of the plans and the erection of the observatory were intrusted to J. A. Fleming, of the Coast and Geodetic Survey, and the results obtained thus far show that his method of construction was a successful one.

The wall insulation of the variation observatory is as follows: Beginning at outside of building, pine weatherboarding, 8-ply building paper, 1-inch pine sheathing, 8-inch air shaft, 1-inch pine sheathing, 8-ply paper, 3 feet pine sawdust, 8-ply paper, ⅞-inch pine ceiling, 3 feet 2 inches air space of passageway, ⅞-inch pine ceiling, 8-ply paper, 1 foot pine sawdust, 8-ply paper, ⅞-inch pine ceiling; slat ventilators or louvre

windows, so arranged and provided with closely fitting shutters that during the winter the 8-inch air shaft referred to can be made practically air-tight, while during summer when opened these tend to admit of the passage and circulation of a cooling draft around building. The insulation beginning at the roof and going down is: Gravel and asphalt pitch roof, 1-inch pine sheathing, 3 feet 8 inches air space communicating with 8-inch air shaft around building and provided with six louvre windows with close-fitting shutters as on those at bottom of air shaft, 1 inch rough pine floor, 3-foot filling of pine sawdust, 8-ply paper, ⅞-inch pine ceiling, 3-foot air space above rooms, 1-inch rough pine floor, 1 foot 6 inches pine sawdust, 8-ply paper, ⅞-inch ceiling. Insulation from bottom of foundation is 2 feet 8 inches of earth, 6-inch to 8-inch layer of screened gravel, about 3 feet pine sawdust, 1-inch pine under floor, 8-ply paper, ⅞-inch pine tongue-and-groove floor.

The greatest danger to fulfillment of the above results lay in the necessity of providing openings through walls for ventilation of rooms and for means of ingress and egress. Four shafts, each 5 by 10 inches and about 16 feet long, furnish air supply to passageway through wooden floor grates. These are provided with heavy rabbeted shutters made to fit very closely and fitted with refrigerator fasteners, so that they may be made air-tight. They are also provided at inlet with copper-wire screens of double thickness to break force of a wind blowing toward opening and to keep out such vermin as field mice. Ventilation of passageway is effected by four shafts opening into air space below roof, each 6 by 10 inches and about 16 feet long, provided with close-fitting slides. Ventilation of air space below roof is effected by three 14-inch copper "Star" ventilators. By the judicious use of these air-supplies and ventilators the danger of direct conduction of temperature changes through shafts can be entirely eliminated. Ventilation of magnetograph rooms from and into passageway is effected in each room by four 3-inch square vertical shafts in sawdust packing having inlet or outlet just below ceiling or above baseboard, according to arrangement of four closing slides provided for each.

To carry off gases of combustion from lamps of magnetographs, 3-inch copper ventilators are provided.

Entrance into building is had through a vestibule on the south side, as shown in Fig. 12, of 10 feet by 13 feet 8 inches outside dimension. Walls of entrance are built similarly to those of main building without the air shaft and but 2 feet of sawdust packing. The outside door can be closed before opening a second door leading into a small entrance hall, which is 6 feet wide and 11 feet long; from this room a third door leads into an opening in the sawdust packing, whence a fourth door opens into the passageway around the rooms. In placing these doors particular care was taken to make them close fitting. Entrance into either of the magnetograph rooms is to be had only from the hall between the two rooms through 8-inch refrigerator patterned doors packed with sawdust.

The diurnal change of the temperature has thus been reduced to a matter of a few tenths of a degree, and in fact it is believed that even this small variation will be eliminated as soon as some other source of light than the present lamps has been introduced. It has been repeatedly found that any sudden change of temperature which may amount to 50°–60° F. outside only makes itself felt gradually inside, and then does not amount to much over 0°.5, and may be even less than this amount. The annual range has

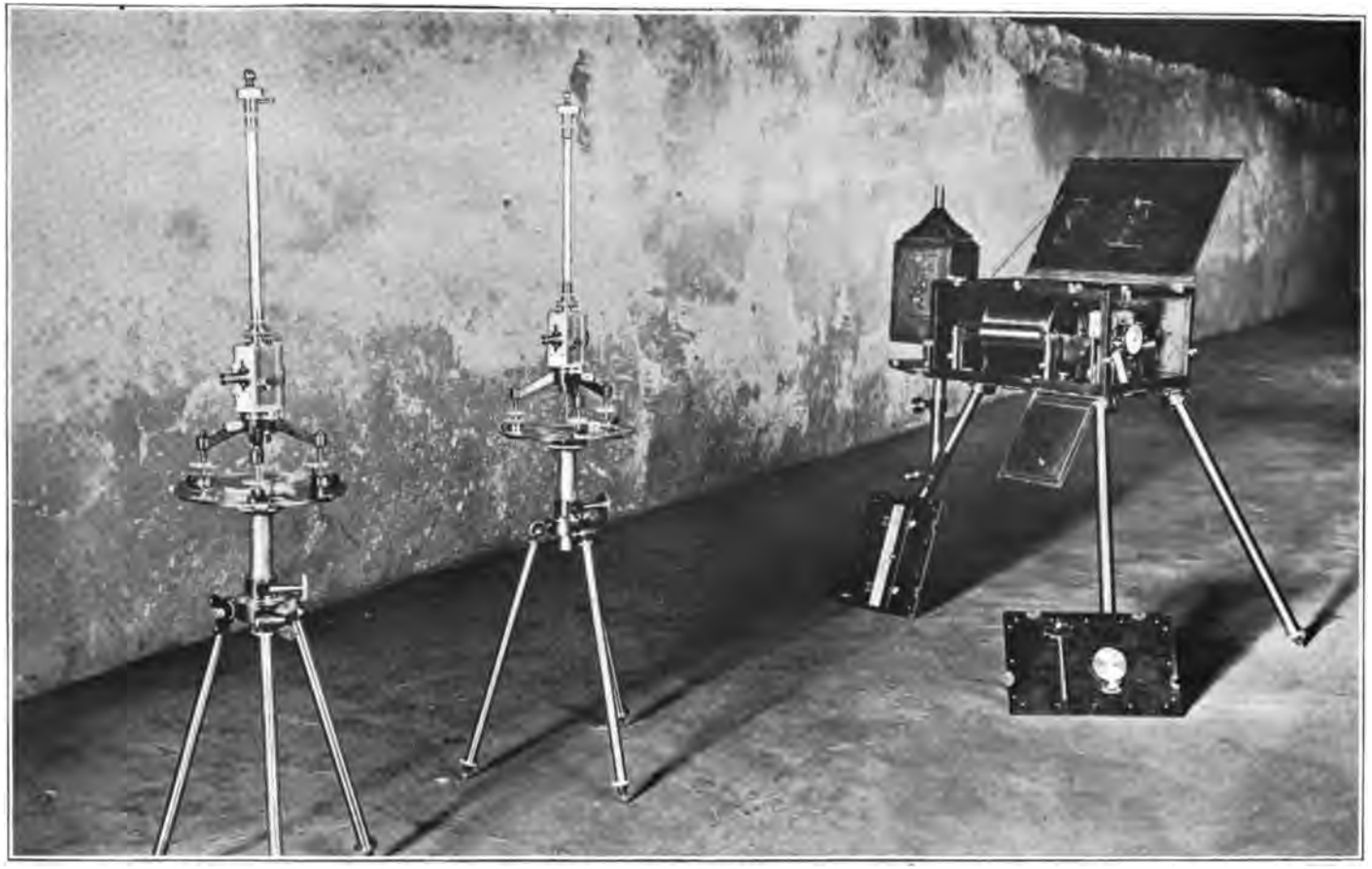


FIG. 13.—ESCHENHAGEN MAGNETOGRAPH AT COAST AND GEODETIC SURVEY MAGNETIC OBSERVATORY, BALDWIN, KANSAS.

been converted into a gradual progressive change, for which allowance can easily be made, and amounting to between one-half and one-third of what it would be outside.

Fig. 13, which shows the magnetograph of the Eschenhagen pattern in place at the Baldwin Observatory, will exhibit the precise arrangement of the instruments.

The two instruments on the left are the declination variometer, by means of which the variations in magnetic declination are obtained, and the horizontal intensity variometer (one in the middle of view) giving the changes in horizontal component of the Earth's magnetic force. The magnets in both instruments are laminar pieces of well-hardened watch-spring steel, about an inch long (25^{mm}) and about one-fourth of an inch wide and about one-sixty-fourth of an inch thick—quite a difference from the meter-long magnets used in Gauss's time. The magnets are suspended by fine quartz fibers passing through the glass suspension tubes, and swing in copper damping boxes. The magnet in the declination instrument hangs in the magnetic meridian, whereas in the horizontal intensity instrument the magnet is turned at right angles to the magnetic meridian by means of torsion of the quartz fiber. A third instrument for registering the variation in vertical intensity completes the set.

On the right of the view are shown the lamp and the recording apparatus. A spot of light supplied by the lamp falls on the mirrors attached to the magnets, and is reflected onto the drum or cylinder inside the recording apparatus, a sensitized sheet of paper (platinum bromide) 15 by 52^{cm} being wrapped around the drum and the drum revolving either once in twenty-four hours or once in two hours, according to circumstances. As the magnet swings to and fro, the spot of light passes back and forth on the sensitized sheet, producing a curved or devious line full of peaks and hollows during time of magnetic disturbance. To provide a base line from which to count the changes, a second spot of light coming from a fixed mirror attached to each instrument traces its record on the revolving cylinder as a straight line.

A shutter operating automatically cuts off the light from the fixed mirror at intervals of one hour and thus the base line is interrupted, the distance between hourly breaks being about 20^{mm}, so that 1^{mm} of the base line represents 3 minutes of time, or 0.1^{mm} (the limit of reading), 18 seconds. If the drum revolves once in 2 hours, as it does during special work, then 1^{mm} of abscissa represents 15 seconds. One millimeter of ordinate, or $\frac{1}{25}$ of an inch, corresponds to a change of 1 minute in the magnetic declination, and about .000025 c. g. s. units in the horizontal intensity, or about $\frac{1}{8000}$ part of the absolute value of the horizontal intensity. As it is possible to estimate $\frac{1}{10}$ of a millimeter, the magnetograms will ordinarially be read to 0.1 of a minute and to .0000025 c. g. s. units ($\frac{1}{80000}$ H).

Figs. 14, 15, and 16 exhibit some of the interesting records already obtained. They are reproductions on half scale of the magnetograms obtained at the Cheltenham Magnetic Observatory with the Adie magnetograph. In this instrument each magnetic element (declination, horizontal and vertical intensity) is recorded on a separate photographic sheet, two days' record being obtained on each sheet. Each figure is composed of three sheets.

Fig. 14 is designed to show the character of the magnetic curves during a comparatively undisturbed period, and especially to exhibit the slight effect due to the Guatemalan earthquake. Beginning on top there are two curves—the declination

curves—marked respectively April 18 to 19 and April 17 to 18, next two straight lines similarly dated, which serve as the base lines for the curves. From the explanation given in the preceding paragraphs it will be evident that the curves result from the spot of light coming from the mirror attached to the magnet, whereas the straight lines are due to the spot of light from the fixed mirror. Considering simply the curve and base line, each dated April 18–19, and measuring the perpendicular distances or ordinates between the base line and the curve at the hourly intervals marked, beginning with 5 p. m., April 18, passing through midnight and continuing until 4 p. m. of the following day, then the difference of these ordinates will give the changes in the magnetic declination from hour to hour for the period of time, 1^{mm} (one twenty-fifth of an inch) of ordinate on the original sheet being 1′.13, and in the figures twice this amount, viz, 2′.26. If the entire ordinate be converted into minutes of arc and added to the base-line value, the actual magnetic declination for each hour from April 18, 5 p. m., to April 19, 4 p. m., can be obtained. As the arrows on the side indicate, a rise in the curve means an increase of the declination (average value is about 5°.1 west), whereas a fall in the curve means a decrease. *The hours as marked are for local mean time; to get seventy-fifth Meridian or Eastern standard time add 7′.3.*

Thus at about 8 a. m., local mean time, the lowest value is reached, and between noon and 1 p. m. the highest one results, the total change amounting to 4^{mm}, or 9′.5.

The same explanation will suffice for the next two curves (in the middle), the changes in the ordinates measured from the corresponding base lines giving the changes in the intensity of the horizontal component of the Earth's magnetic force or the force acting on the compass needle. The bottom curve and base line records the changes in the vertical intensity, the vertical intensity curve for April 17 to 18 having been omitted purposely to avoid confusion.

One millimeter of ordinate for either the horizontal or vertical intensity curve corresponds practically to 0.00005 c. g. s. unit, and on the original sheets to half of this amount. It will be noticed that the principal minimum of the horizontal intensity occurs at about 9 a. m. local mean time and the principal minimum of the vertical intensity curve occurs a little after 10 a. m.

Comparing the three separate sets of curves, it will be seen that the middle one—horizontal intensity—shows a number of small fluctuations not occurring in the other curves, and in fact this curve is rarely without disturbances of some kind.

Special attention is directed to the peculiar appearance of the curves (declination, horizontal intensity, and vertical intensity) between 9 and 10 p. m. on April 18, the curves being almost entirely obliterated for part of the way. This peculiar occurrence can be traced to the Guatemalan earthquake, the maximum effect of which was recorded at $9^h\ 40^m$ (seventy-fifth Meridian or Eastern time) on the Milne seismograph which Dr. H. F. Reid has had mounted at the Johns Hopkins University, Baltimore.

The late Professor Eschenhagen, who examined a number of such cases of earthquake effects registered on magnetic instruments, came to the conclusion that the effect was probably entirely a mechanical one, due to the vibration of the piers on which the instruments were mounted, and not a magnetic effect.

Other breaks in the curves, e. g., about 5 p. m., 8 a. m., and 4 p. m., are the "time breaks" and are purposely made in order to obtain the data for dividing up the base line into hourly intervals. (On the Eschenhagen magnetograph, as explained, this is done automatically.)

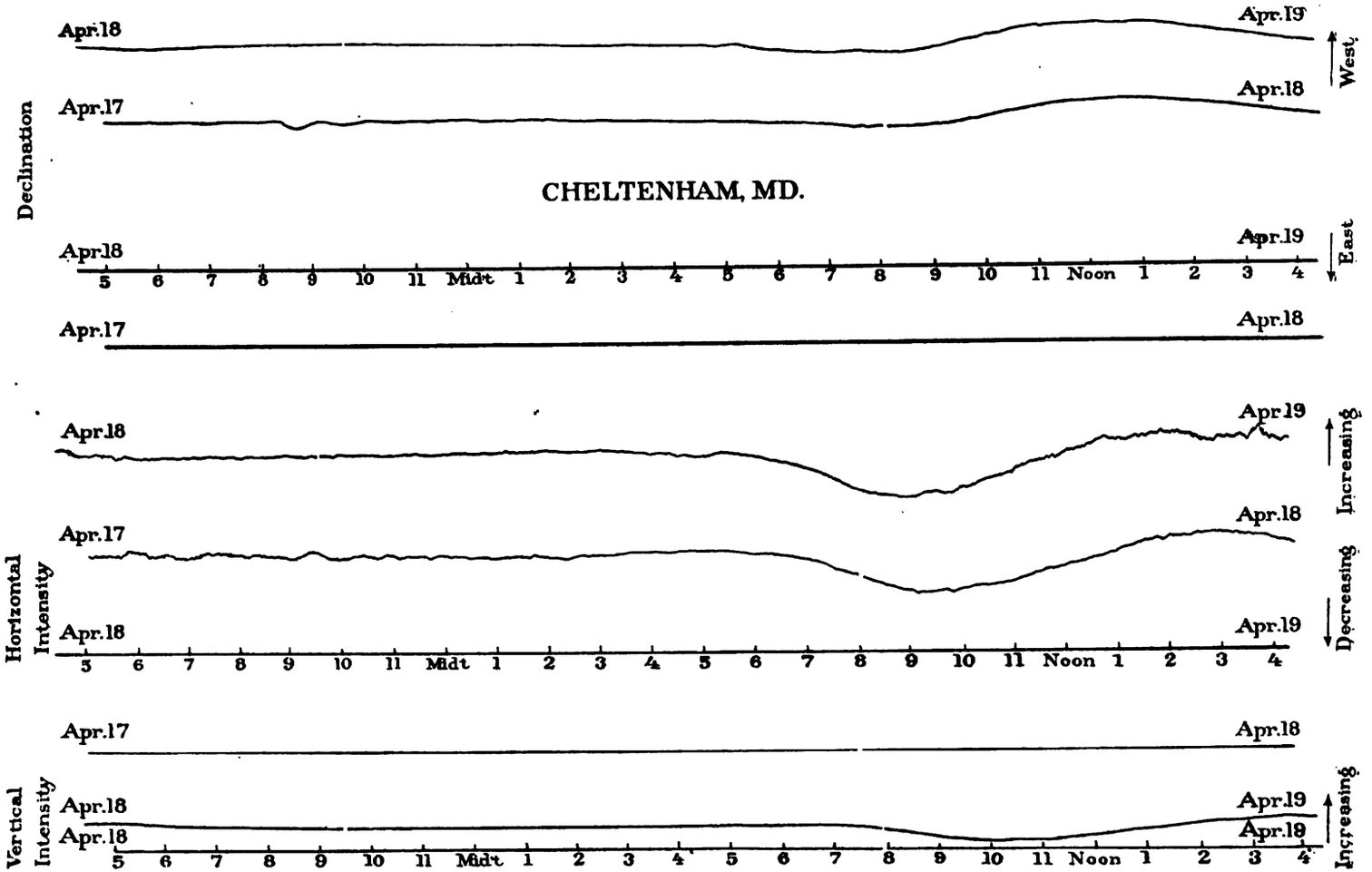


FIG. 14.—MAGNETOGRAMS SHOWING GUATEMALA EARTHQUAKE DISTURBANCE AT CHELTENHAM MAGNETIC OBSERVATORY, APRIL 18, 1902.

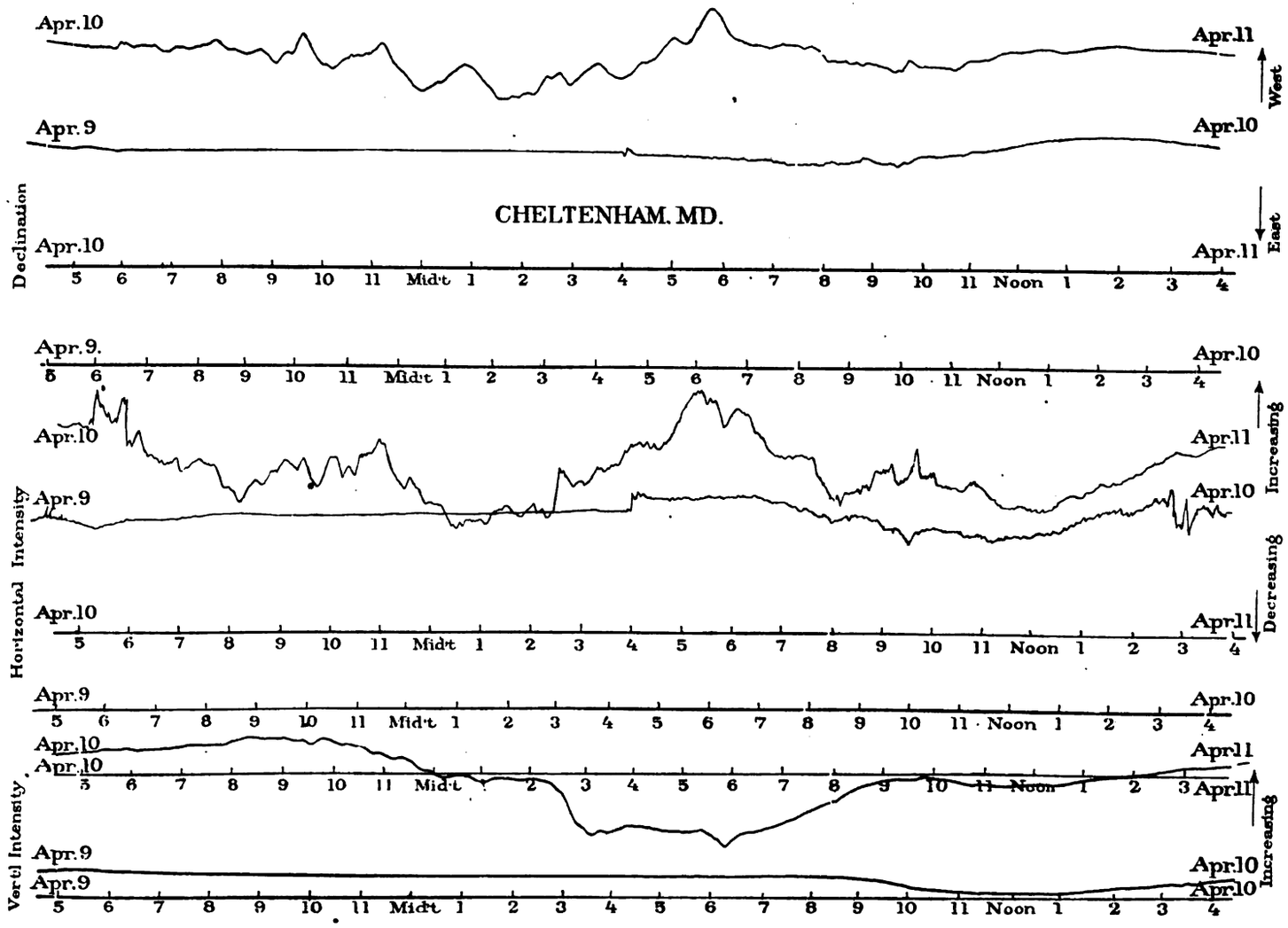


FIG. 15.—MAGNETOGRAMS SHOWING MAGNETIC DISTURBANCE AT CHELTENHAM MAGNETIC OBSERVATORY, APRIL 10-11, 1902.

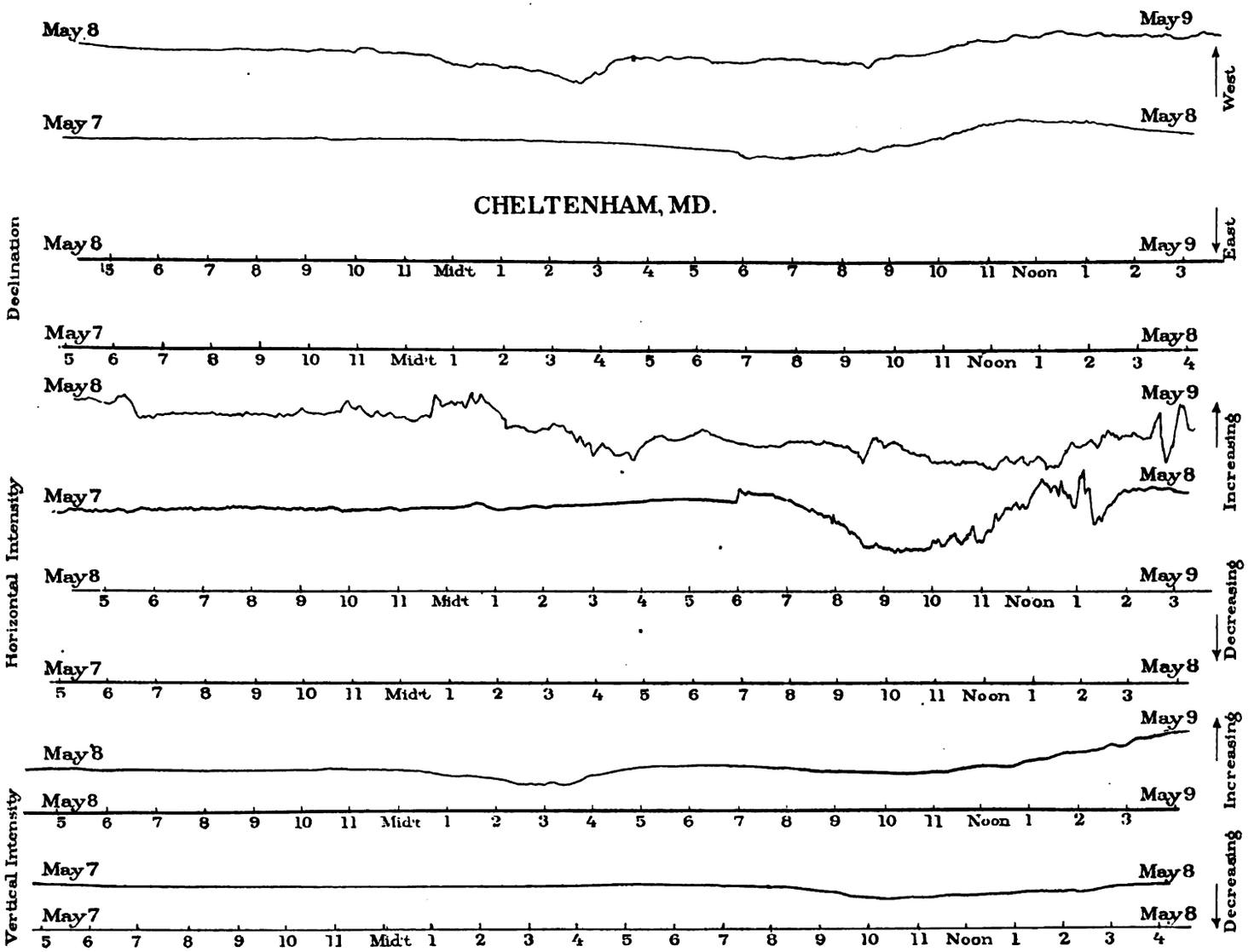


FIG. 16.—MAGNETOGRAMS SHOWING MAGNETIC DISTURBANCE AT CHELTENHAM MAGNETIC OBSERVATORY AT TIME OF MARTINIQUE VOLCANIC ERUPTION, MAY 8, 1902.

Fig. 15 shows the curves on a disturbed day. Looking at the second curve from the top, it is seen that the declination curve runs along smoothly until somewhat after 4 a. m., local mean time, April 10 (see second base line marked April 9–10), when it is suddenly interrupted. Thereafter it exhibits a number of fluctuations until the end of the curve. Continuing now on the upper curve marked April 10, still more marked fluctuations are exhibited until a little before 6 p. m., April 11 (first base line) the highest point is reached, the curve dropping thereafter. The change in declination between this point and the lowest one which occurred about four hours before is nearly 33′.

Passing on to the two middle curves—the horizontal intensity—it is found that the fluctuations are even more marked than for the declination curves, the beginning taking place very abruptly. The vertical intensity curve likewise exhibits large fluctuations.

This magnetic storm lasted about two days, and began practically simultaneously at the four magnetic observatories of the Coast and Geodetic Survey, viz, Cheltenham, Md.; Baldwin, Kans.; Sitka, Alaska, and Honolulu, Hawaiian Islands. At Sitka the disturbance in declination was 2° and over, part of the record being lost, having gone beyond the edge of the paper.

Fig. 16 reproduces a magnetic disturbance, which, as in the previous case, began very abruptly (see especially fourth curve). Now, the remarkable thing is this, that the time of beginning of this storm was coincident, as far as can at present be ascertained, with the time of the eruption of Mont Pelée (Martinique) on May 8. The magnetic disturbance began simultaneously at the Cheltenham and at the Baldwin observatories at $7^h\ 55^m$ St. Pierre local mean time. According to the newspaper reports, the catastrophe befell St. Pierre about 8 a. m. of May 8, and it was stated that the town clock was found stopped at $7^h\ 50^m$; how accurately this clock kept local mean time is, of course, not known. This disturbance was purely a magnetic one and not a seismic one, as that shown in Fig. 14, and was not recorded on seismographs. The Cheltenham magnetograms exhibit fluctuations amounting at times from .0005 to .0006 c. g. s. unit (about $\frac{1}{350}$ of the value of the horizontal intensity), and from 10′ to 15′ in declination.

On the morning of May 20, from $4^h\ 07^m$ to $4^h\ 16^m$ Eastern time, or $5^h\ 03^m$ to $5^h\ 12^m$ St. Pierre local mean time, there again occurred a slight disturbance of the magnetic needles at the Cheltenham Magnetic Observatory, beginning abruptly and reaching its maximum effect at $5^h\ 07^m$. From $11^h\ 57^m$ p. m., May 20, to $0^h\ 09^m$, May 21, Eastern time, or from $0^h\ 53^m$ to $1^h\ 05^m$ a. m., May 21, St. Pierre local mean time, a similar but somewhat larger disturbance occurred.

According to the cable dispatch from Governor L'Huerre, of the Island of Martinique (mentioned in the Associated Press dispatches), sent from Fort de France and dated Tuesday, May 20, the second eruption of Mont Pelée apparently began about $5^h\ 15^m$ a. m.—closely coincident with the time of the first magnetic disturbance given above.

Respecting the second magnetic disturbance, about midnight of the 20th, it is of interest to note that almost continuous earthquake shocks were felt at St. Augustine, Fla., from 9 to midnight, May 20.

The Coast and Geodetic Survey has undertaken a special study of the interesting occurrences above described, and has sent a request for information to every magnetic observatory in foreign countries.

MAGNETIC CHARTS.

Isogonic Lines.

The most convenient form in which to represent magnetic data for practical use, namely, by drawing lines through the places having the same magnetic declination, the same magnetic dip, or the same magnetic intensity, is generally supposed to have been employed for the first time by Dr. Edmund Halley, the noted astronomer, who, at the beginning of the eighteenth century, published two charts of the "lines of equal magnetic variation (declination)," which are here called, respectively, the "Atlantic Chart" and the "World Chart." According to Hellmann, however, Christoforo Borri, of Milan, appears to have made the first attempt to construct lines of equal magnetic declination, but did not publish them.

The "Atlantic Chart," doubtless published in 1701, gave the lines of "equal magnetic variation" chiefly over the Atlantic Ocean, based upon Halley's observations, made between 1698 and 1700 on the ship *Paramour Pink*, the expenses of the expedition having been borne by the English Government, this fruitful expedition representing the first systematic effort made at a magnetic survey of the globe. In no case were the lines on this chart drawn over land areas.[a]

The "World Chart," frequently referred to under the title of "Tabula Nautica," published later than the preceding one (probably in 1702), besides containing the "lines of equal variation" for the Atlantic Ocean, also gave them for the Indian Ocean and the extreme western part of the Pacific Ocean. (See Fig. 19.) In a few instances the lines were drawn across the continents. This was reproduced by Airy in the Greenwich Observations for 1869, and again by Hellmann[a] in 1895.

Revisions of Halley's chart, made necessary by the progressive change in these lines of equal magnetic declination with the lapse of time, were made after Halley's death by Messrs. Mountaine and Dodson in 1744 and 1756. The most complete collection of early charts of the lines of equal magnetic declination (isogonic charts) and of equal magnetic dip (isoclinic lines) will be found in Hansteen's Atlas, belonging to his famous work "Magnetismus der Erde," Christiania, 1819, and in Hellmann's facsimile reprints,[b] to which latter work the reader is referred for a detailed historical account.

The following series of isogonic charts from 1600 to 1858 (Figs. 17–20) have been reproduced on a reduced scale from Neumayer's excellent Atlas des Erdmagnetismus, published by Justus Perthes, Gotha, 1891, those of 1600 and 1800 being due to Hansteen, and published in 1819, that of 1700 to Halley, and the one of 1858 to the British Admiralty. Van Bemmelen has recently constructed isogonic charts for 1500 (see Fig. 4), 1550, 1600, 1650, and 1700, based on an exhaustive collection of early declination values.[c] A careful scrutiny of them is earnestly recommended to the reader. Let him pick out, for

[a] A copy of this chart, whose existence had escaped attention, was found by the writer in 1895 in the British Museum, and reproduced by him with commentary notes in the journal "Terrestrial Magnetism," Vol. I, No. 1, 1896.

[b] "Die ältesten Karten der Isogonen, Isoklinen, Isodynamen," Berlin, A. Asher & Co., 1895. (At the time of this publication Hellmann was not aware of the "Atlantic Chart," and so erroneously believed that the "World Chart" was the original Halley Chart of 1701.)

[c] "Die Abweichung der Magnet Nadel," Batavia, 1899.

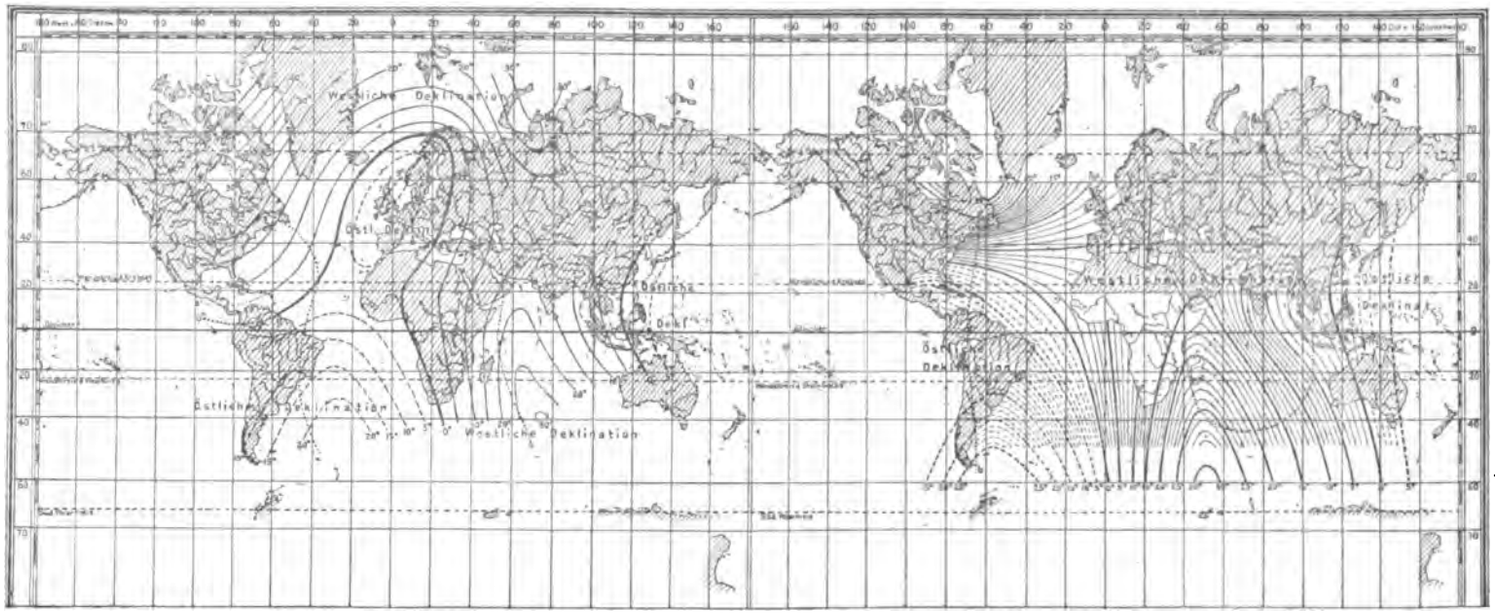


FIG. 17.—LINES OF EQUAL MAGNETIC DECLINATION FOR 1600 (HANSTEEN).

FIG. 18.—LINES OF EQUAL MAGNETIC DECLINATION FOR 1700 (HALLEY).

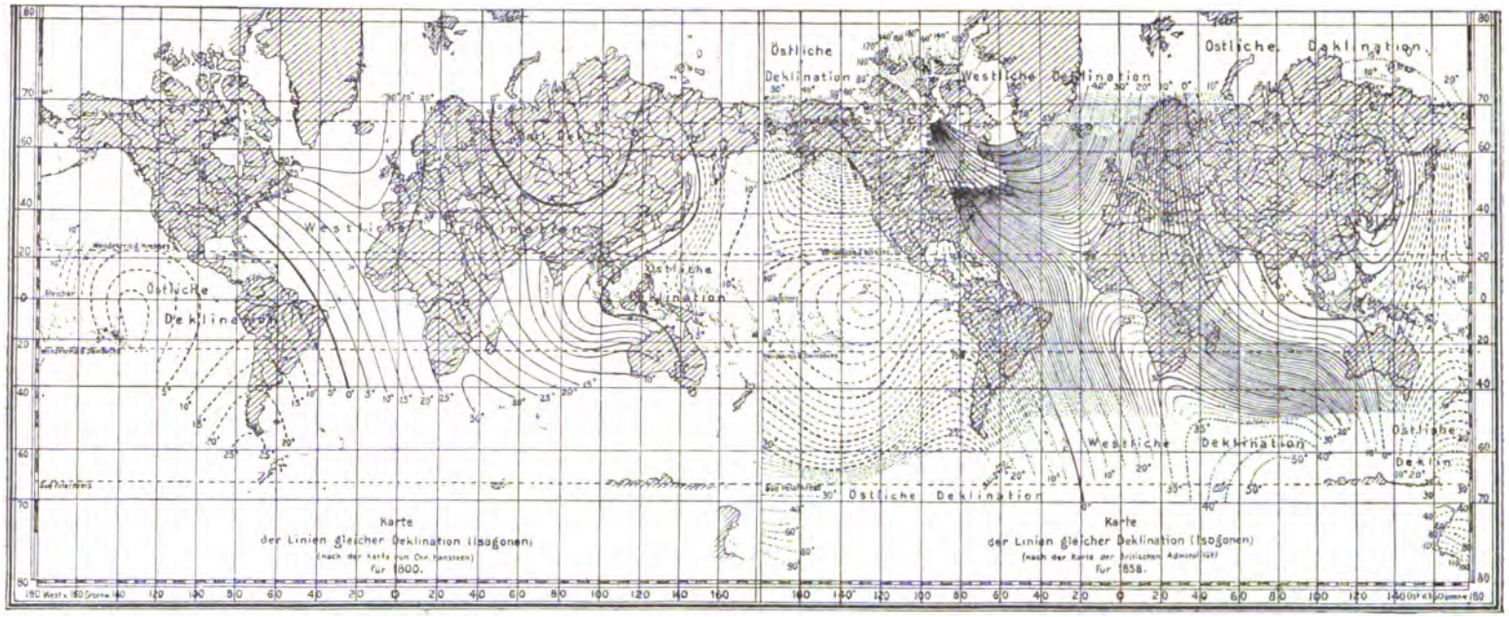


FIG. 19.—LINES OF EQUAL MAGNETIC DECLINATION FOR 1800 (HANSTEEN).

FIG. 20.—LINES OF EQUAL MAGNETIC DECLINATION FOR 1858 (BRITISH ADMIRALTY).

example, an agonic line (line of no magnetic declination) and follow its various transformations from period to period. Or let him compare the chart of 1600 with that of 1905, given later, and notice what a complete reversal there has been in the distribution of the Earth's magnetism, as represented by the lines of equal magnetic declination. Thus in 1600 the declination over the western and southern parts of the Atlantic Ocean and over western Europe and western Africa was *east*, whereas to-day, over the same portions of the Earth, the declination is *west*.

The chart (Fig. 21) of 1905 was reproduced from the British Admiralty Manual of Deviations of the Compass, 1901. The isoclinic chart, giving the lines of equal magnetic dip for 1905 (Fig. 22), has been taken from the same source.

In looking over the series of isogonic charts, two main lines of zero or no magnetic declination (agonic lines) intersecting the equator, a western one and an eastern one, can be recognized. If the longitudes of the intersections were determined from time to time and represented graphically, the ordinate being the longitude and the abscissa the corresponding year, it would be seen that for nearly three hundred years there has been a progressive and almost uniform motion of these two agonic lines to the *westward*, the western agonic at an average annual rate of nearly 14 minutes in longitude and the eastern agonic at an average annual rate of about 8 minutes in longitude. Were the western agonic to make a complete revolution of the Earth at the rate given, it would take it nearly one thousand six hundred years, whereas the eastern agonic would require about two thousand six hundred years. These results show how fruitless it is to endeavor to determine the secular change period from the supposed motion of the agonic lines around the Earth. The result reached will depend not only upon the agonic selected, but also upon the parallel of latitude along which the sliding around the Earth is supposed to take place.[a]

Magnetic Meridians.

The lines of equal magnetic declination, while representing magnetic declination data in a convenient and practical form, do not actually exist in nature; they are merely an artificial set of lines devised to serve a useful purpose, which they admirably fulfill. The so-called "magnetic meridians," with which the isogonic lines are often confounded, give a better representation of the actual magnetic condition of the Earth. They are the lines along which one would travel were he to set out at any place on the Earth and always follow the direction of the compass needle, and hence they exhibit at every point the actual direction of the compass needle, not by numbers, but by angles. The magnetic declination at any point will be the angle between the magnetic and the true meridian passing through the point.

Fig. 23 gives the magnetic meridians for 1836 as drawn by Captain Duperrey. It will be noticed that they all pass through two points—one in the Northern Hemisphere, the North Magnetic Pole, and the other in the Southern Hemisphere, the South Magnetic Pole. The lines cutting across the magnetic meridians at right angles, which in the present instance are the lines of equal "potential," Duperrey termed the "magnetic

[a] In this way Lord Kelvin deduced his much-quoted period of nine hundred and sixty years.

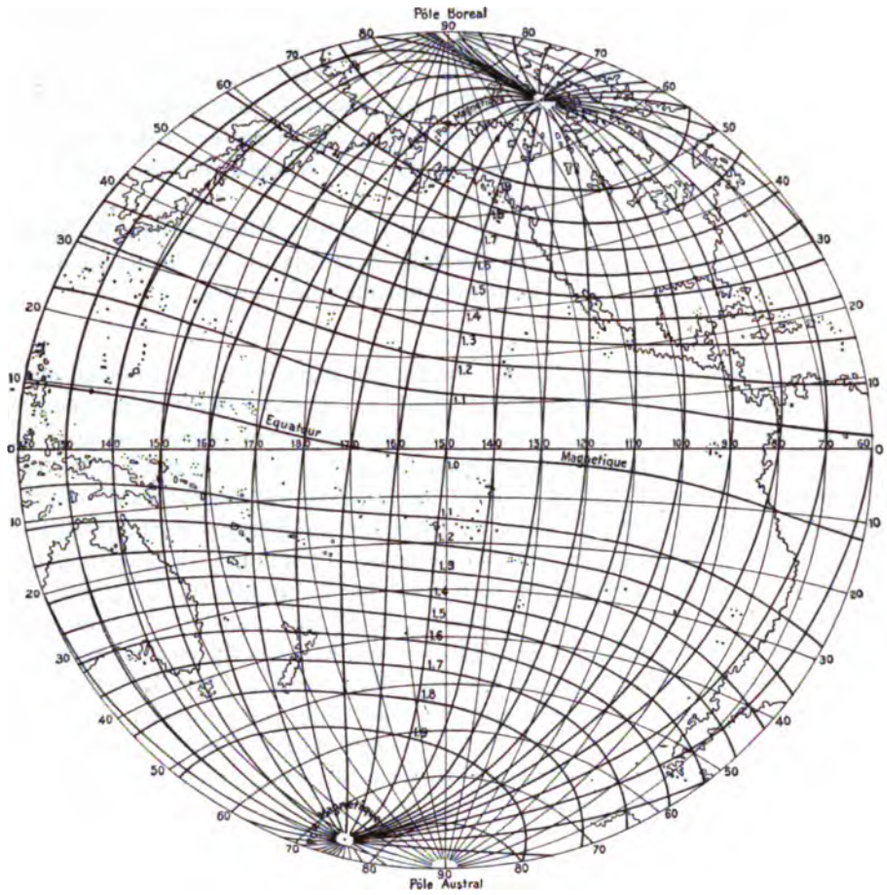


FIG. 23.—Magnetic meridians for 1836 (Duperrey).

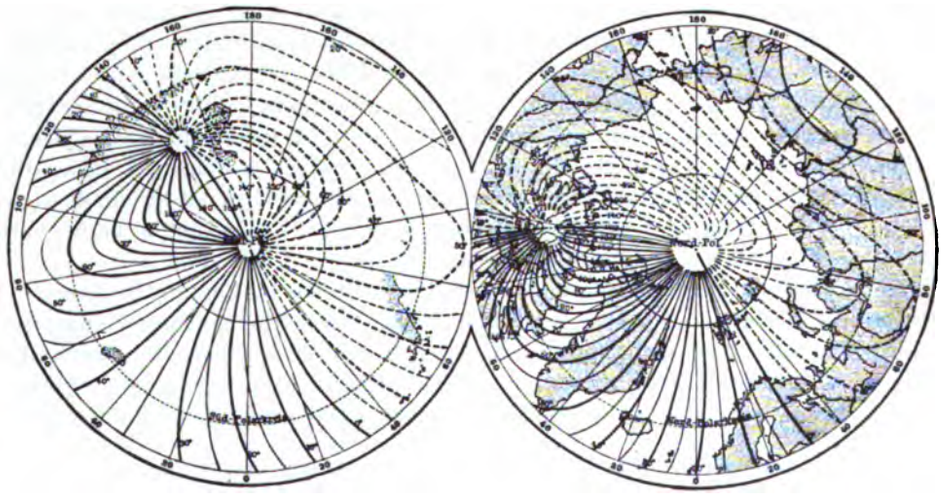


FIG. 24.—Lines of equal magnetic declination in the polar regions for 1885 (Neumayer).

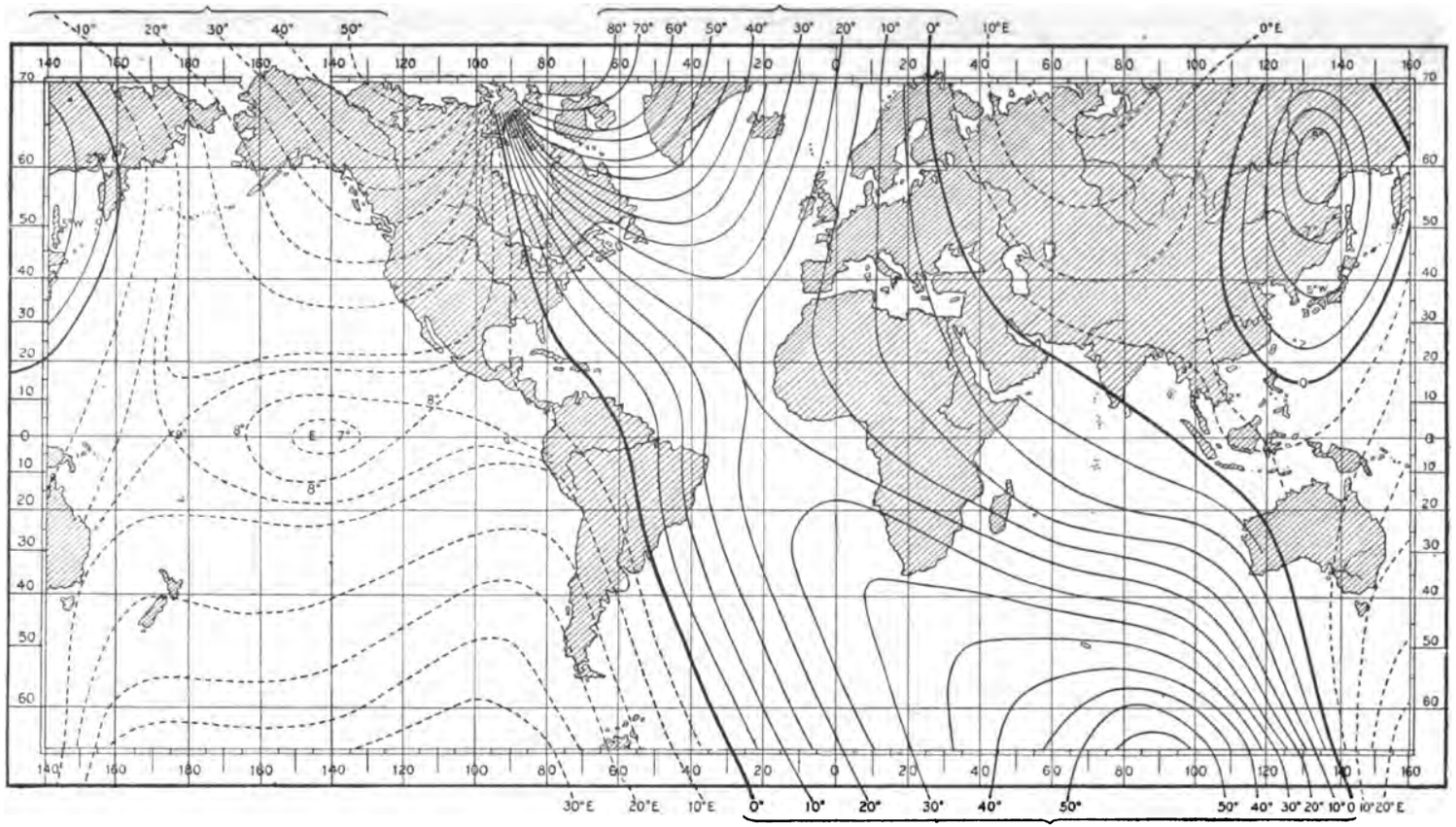


FIG. 21.—LINES OF EQUAL MAGNETIC DECLINATION FOR 1905 (BRITISH ADMIRALTY).

[Full lines indicate west magnetic declination and broken lines east magnetic declination.]

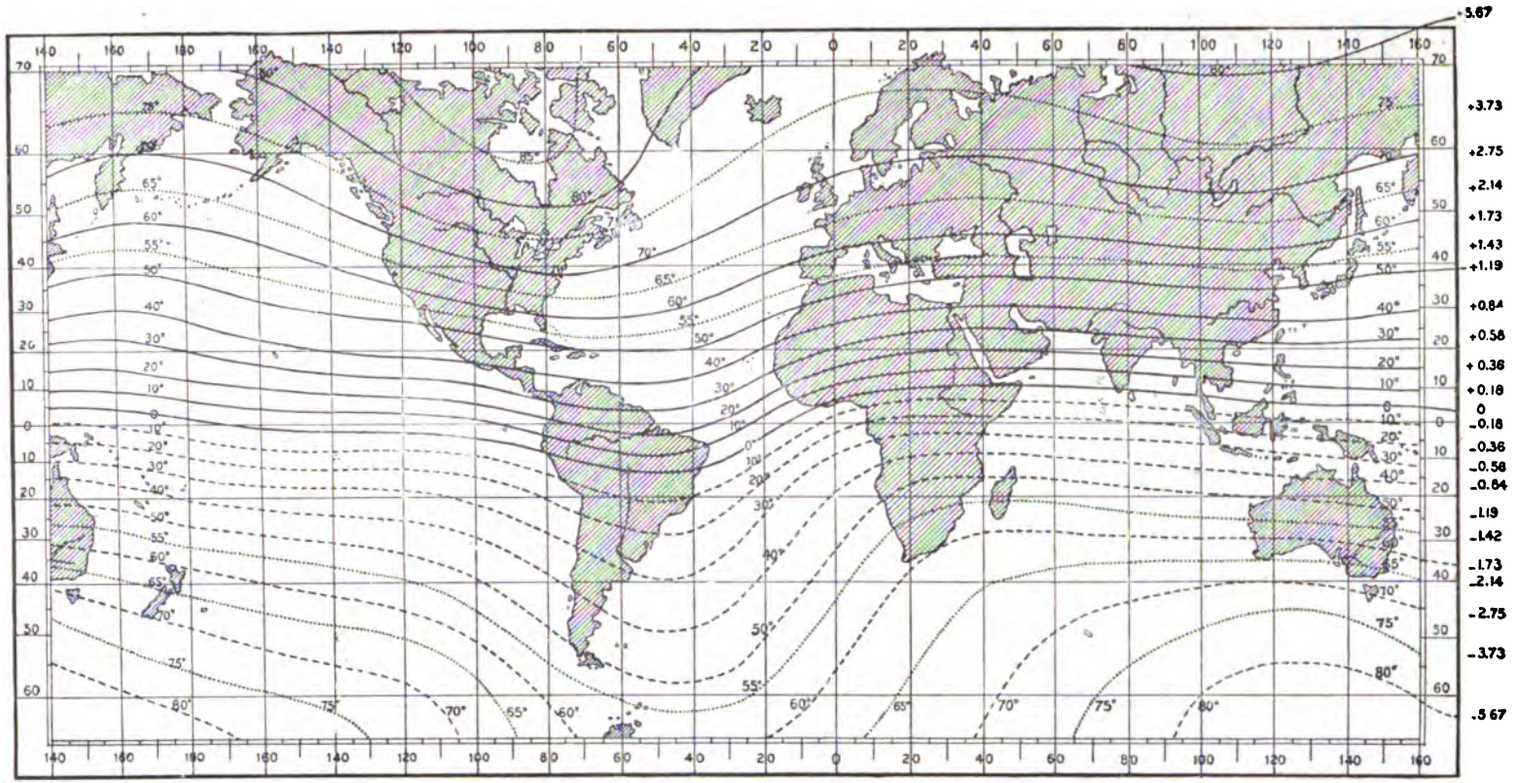


FIG. 22.—LINES OF EQUAL MAGNETIC DIP FOR 1905 (BRITISH ADMIRALTY).

parallels." It is more usual, however, to call the lines of equal dip the "magnetic parallels."

The isogonic lines, on the other hand, pass through four points—two in each hemisphere, the magnetic pole and the geographical pole. (See Fig. 24, which gives these lines for 1885, as reproduced from Neumayer's "Atlas.") In other words, at both points in each hemisphere it is possible to have all values of the magnetic declination; at the magnetic pole because there all magnetic meridians converge, and at the geographical pole because there all true meridians meet, and since the magnetic declination is the angle between the magnetic meridian and the true meridian, it is therefore possible to have every value of the magnetic declination at each of the two points. There is this distinction between them, however: At the magnetic pole the compass has no definite direction, all the force acting at this point being vertically downward, so that there is no force in the horizontal plane pulling the compass into any fixed direction; the true north and south direction is, however, a fixed one. At the geographical pole, however, the true direction is anything you please, while the compass direction is a perfectly definite one.

MAGNETIC SURVEYS.

General Remarks.

The present time is witnessing a remarkable revival of interest in magnetic work. Magnetic surveys are either already under way or contemplated for the near future in nearly every civilized country. From the Antarctic expeditions valuable results may be expected in a region almost destitute of data, and where in fact nothing has been obtained since the observations of Ross and Crozier in the ships *Erebus* and *Terror* and of Moore and Clerk in the *Pagoda*, sixty years ago.

Unfortunately, however, in the regions of the Earth where information regarding the magnetic needle is of the highest practical importance to the seaman in these days, when every effort is bent to increase the speed of a vessel by a knot over the great ocean basins continually traversed—the Atlantic, the Pacific, etc.—there almost no magnetic data are at present being obtained. But very little data regarding the magnetic declination of the needle, say nothing of the dip and intensity, have been obtained in the ocean areas since the advent of iron ships, except from occasional expeditions. The present lines of equal magnetic declination, or, as the mariner terms them, "lines of equal magnetic variation," over these waters depend almost entirely upon results acquired in wooden ships 50 to 100 years and more ago. It is therefore impossible to state just how accurate they may be. When it is remembered that in times of fog and darkness, with no celestial object visible, sole reliance must be placed on the log, compass, and the variation charts, the importance of a systematic magnetic survey of ocean areas needs no further argument. Fortunately all evidence goes to show that over the deep waters of the ocean most frequently traversed, the Atlantic, the present lines of equal magnetic declination are doubtless correct within 1°. In shallow waters, however, and near coast lines, where danger of shipwreck is most imminent, greater errors in the lines can be confidently expected. Respecting the Pacific Ocean, it is impossible to form an accurate opinion as to the correctness of the mariner's "variation charts." Unfortu-

nately, almost the universal practice employed by seamen in these waters is to deduce the compass deviation, or compass correction, due to the ship's own magnetism, entirely with the aid of the "variation charts;" and rarely do they control their table of deviation corrections by "swinging ship." The difference between the observed "variation of the compass" on board ship and that scaled from the variation charts, is ascribed wholly to the local magnetism of the ship, and called the "deviation of the compass" on the course on which the "variation" was observed. This difference, however, is due to three causes: (1) Ship's own magnetism; (2) error in variation charts; (3) error in mariner's observation. If mariners in the Pacific Ocean would likewise swing ship, when opportunity offered, and thus determine the deviations of the compass on various courses independently of the charts, valuable data would be furnished those whose duty it is to construct "variation charts."

The Coast and Geodetic Survey is making arrangements to fit out its vessels with the necessary instruments for determining the magnetic elements at sea.

Besides the need of a systematic magnetic survey of ocean areas, there are vast areas of the Earth, some under the control of civilized nations, which have not yet been magnetically explored.

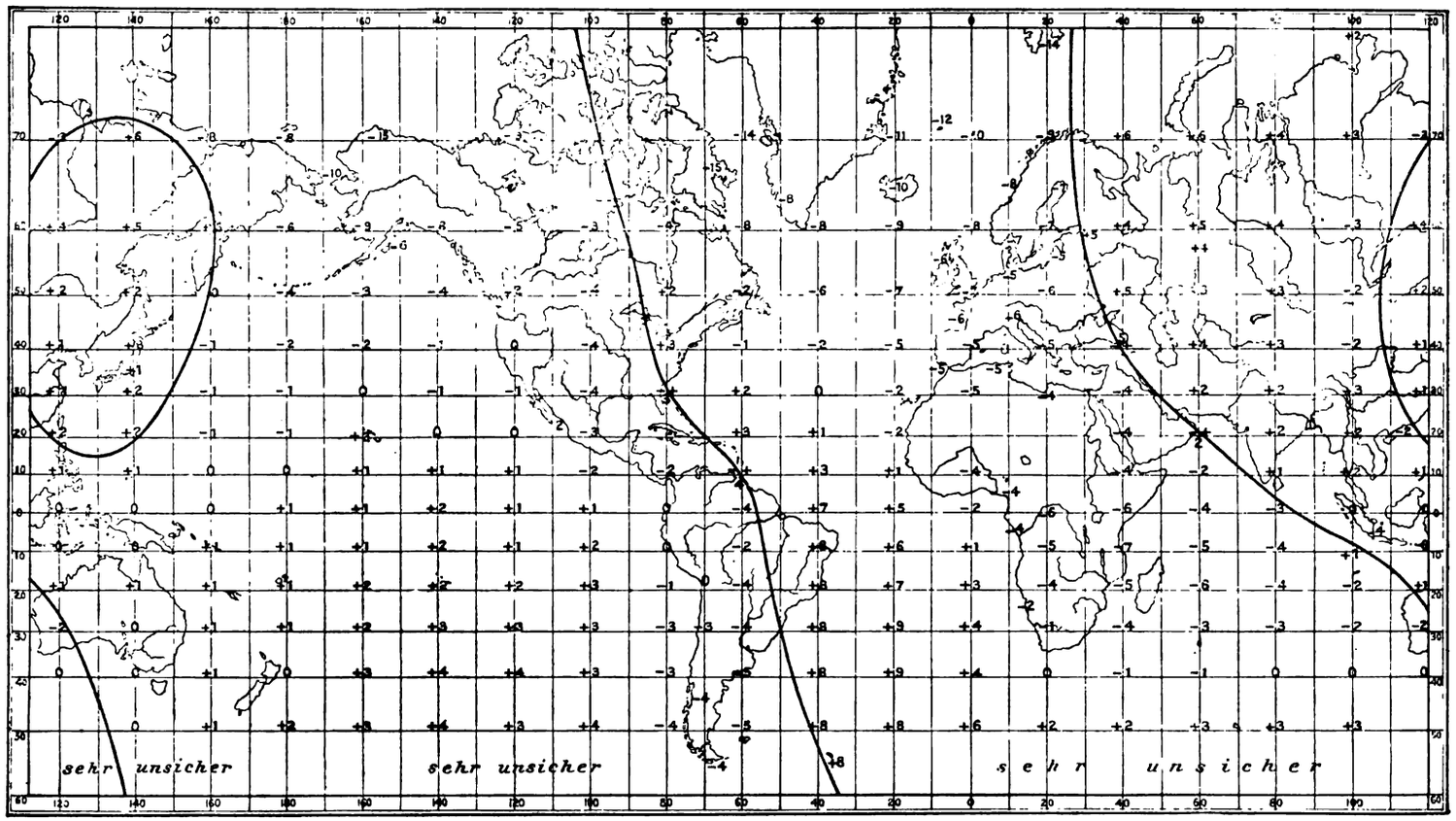
The complete solution of some of the vexed problems of the Earth's magnetism of international interest, can not be accomplished until some of the gaps in knowledge as above pointed out have been filled.

The necessity of obtaining facts for keeping "variation charts" up to date, i. e., correcting them for secular change, has already been made apparent in the previous section on "Magnetic charts." It has been shown that it does not take many years to make appreciable changes. Fig. 25, due to Neumayer, gives the amount of annual change of the magnetic declination for various parts of the Earth. It will be seen that along the tracks usually followed by steamers plying between New York and England, the change may be as much as 6 minutes a year—that is, 1° in 10 years—while over other ocean areas, e. g., South Atlantic, a change of 1° may be expected in about 6½ years.[a] Over the greater part of the Pacific Ocean, the change, at present (it may not always be so), is on the average about 2 minutes per year, or 1° in 30 years. For the United States, as will be seen by turning to the Chart, the change is from 0′ to 5′, the average being about 3′, or 1° in 20 years.

[a] An error of 1° in a course a mile long amounts to an error in distance of 92.2 feet. Supposing a speed of 20 knots an hour, a vessel persisting on a course erroneous by 1° would be out at the end of the day's run about 9.6 miles, or 8.4 knots—nearly one half hour in time. Thus, when every nerve is being strained to cut down the time of crossing the ocean by an hour or so, the need of being able to hold a vessel true to her course is apparent.

When the mariner is obliged to rely entirely upon the compass and the log, the uncertainty in fixing the ship's position at the end of a day's run is due to the error in distance traversed and to the error resulting from imperfect knowledge of the true bearing of the course followed. If, therefore, it were possible to add another factor for fixing the ship's position, e. g., if sufficiently accurate dip observations were possible on board ship, they might help materially, with the aid of the isoclinic charts, to fix the position.

In times of clear weather, when celestial objects are visible, there would of course be no need of a "magnetic" method for determining the ship's position, but when no astronomical method can be employed then any additional information to that supplied by the compass and the log is greatly to be desired.



East declination. West declination.

FIG. 25.—MEAN SECULAR CHANGE OF THE MAGNETIC DECLINATION FOR THE PERIOD 1890–1900, BY G. NEUMAYER.

[The *plus* sign denotes that the prevailing declination, whether it be west or east, is *increasing* by the amount given in minutes, whereas the *minus* sign means that it is *decreasing*.]

HISTORICAL SUMMARY.[a]

The first complete magnetic survey in which the three magnetic elements—declination, dip, and intensity—were determined, and which was executed as a national piece of work and was coextensive with the limits of the country surveyed, was that of the British Islands, corresponding to January 1, 1837. This survey was undertaken in 1836 at the request of the British Association for the Advancement of Science, and was completed in 1838. The example set by Great Britain was speedily followed by the execution of similar surveys in various portions of the globe—in Austria, Bavaria, Germany, Holland, Belgium, France, Canada, etc. At the present time nearly every civilized country has been surveyed magnetically to a greater or less extent.

But such surveys must be repeated after the lapse of a number of years on account of the slow, yet appreciable, change forever going on in the Earth's magnetic state, which change, as one of the most noted physicists has truly said, is a warning "that we must not suppose that the inner history of our planet is ended." Thus after the lapse of twenty years Great Britain—again at the instance of the British Association for the Advancement of Science[b]—repeated its original magnetic survey.[c] The observations were taken between 1857–1862. In the Philosophical Transactions of the Royal Society for 1870 will be found a full account of this survey and likewise of the earlier one. In this paper Sir Edward Sabine combined the observations of the two surveys and drew the isomagnetic lines for the mean period of 1842–1845. Recently Great Britain has completed a *third* magnetic survey, far more elaborate than any of the preceding surveys. This survey, one of the most carefully executed up to date, was conducted by two most eminent physicists, Professors Rücker and Thorpe.[d] It is a most fruitful piece of work. Observations of the three elements were made at first by the two distinguished professors themselves between the years 1884–1888 at 205 places.[e] The government grant committee of the Royal Society then made a liberal grant so that the survey might be carried out on a larger scale than hitherto attempted. Two assistant observers were then employed, and with their aid, in the four years 1889–1892, the grand total of the number of stations was brought up to 882, making on the average 1 station to every 139 square miles of land area.[f] The isomagnetic lines corresponding to the epoch 1886–1890, and based on the 205 observations made between the years 1884–1888, were drawn, and likewise those as based on the 677 stations observed in 1889–1892, were constructed for the epoch 1891, and finally the

---

[a] Quoted largely from the writer's First Report on Magnetic Work in Maryland.

[b] Doubtless no national organization has done so much for the advancement of the subject of terrestrial magnetism as this most distinguished body of scientific men. Money grants have been freely made; committees on terrestrial magnetism composed of the most eminent physicists have been formed from time to time, and cooperation has been extended and encouragement given to magnetic enterprises in many ways.

[c] Report on the Repetition of the Magnetic Survey of England, by Maj. Gen. Edward Sabine. Report of the British Association for the Advancement of Science for 1861.

[d] Dr. Thorpe has made a number of determinations of the magnetic elements in the United States.

[e] The results were published in the Phil. Trans. of the R. S., 1890, A, p. 53, the memoir constituting the Bakerian lecture of that year.

[f] The results of this last work have just been published, Phil. Trans. R. S., vol. 188, A, 1896.

lines as resulting from *all* the stations were obtained. A splendid opportunity was thus afforded for testing the accuracy with which the positions of the isomagnetic lines, e. g., the lines of equal magnetic declination or variation, can be inferred from observations in greater or less number. For further details the reader is referred to Professor Rücker's interesting account[a] published in Terrestrial Magnetism for July, 1896.

Professor Rücker's[b] results regarding the relation of magnetic disturbances and geological formations are of such universal interest that they are quoted in toto:

"It has long been known that just as the secular variation of the magnet is accompanied by minor diurnal changes, so the large alterations in the direction of the compass and dipping needle, which are observed when we move from place to place on the surface of the earth, are affected by irregularities which are due to purely local causes. Thus the declination is greater in Ireland than in England; but the increase is not uniform as we pass from one country to the other. In fact in some districts an abnormally large increase is followed by a decrease.

"These curious inequalities must be due to local disturbing forces, and the large number of observations which have been made in this country [Great Britain] have enabled us to determine with more than usual accuracy the magnitude and direction which the magnetic forces would assume if they were undisturbed by any local cause, and from the difference between things as they then would be and things as they actually are, we can calculate the magnitude and direction of the disturbing forces themselves. When these are represented on a map, it is found that there are large districts of the country in which the disturbing horizontal forces act in the same direction; in one region the north pole of the needle will be deflected to the east, in another to the west, and, as we pass from one of these districts to the other, we always find that at the boundary the downward vertical force on the north pole of the needle reaches a maximum value. We are thus able to draw upon the map lines toward which the north pole of the needle is attracted. It is found that the exact position of these can be determined with considerable accuracy, and that the lines can be traced without any possible doubt through distances amounting, in some instances, to a couple of hundred miles. The key to this curious fact is probably furnished by observations in the neighborhood of great masses of basalt or other magnetic rocks. If these were magnetized by the induction of the earth's magnetic field, the upper portions of them would, in this hemisphere, attract the north pole of the needle; and it is found that where large masses of basalt exist, as in Antrim, in the Scotch coal fields, in North Wales, and elsewhere, the north pole of the needle is, as a matter of fact, attracted toward them from distances which may amount to 50 miles. The thickness of the sheets of basalt is in most cases too small to furnish a complete explanation of the observed facts, but it is quite possible that these surface layers of magnetic matter are merely indications of underground protuberances of similar rocks from which the surface sheets have been extruded. At all events, there is no possible doubt of the fact that where large masses of basalt occur, the north pole of the needle tends to move toward them.

"There are other regions where the attractions are manifest, but where, nevertheless, no magnetic rocks occur upon the surface; but it is most probable that the cause is the same, and that it is due to the mere accident of denudation that in one case we can, and in the other we can not, point to the magnetic rocks to which the anomalous behavior of the compass is due. *If this be so, it is certainly interesting that magnetic observations should enable us to penetrate to depths which the geologist can not otherwise reach, and that the lines which we draw upon the surface of the map, as those to which the north pole is attracted, may, in fact, roughly represent the ridge lines of concealed masses of magnetic rocks, which are the foundations upon which the deposits studied by the geologist have been laid.*

---

[a] A. W. Rücker: A Summary of the Results of the Recent Magnetic Survey of Great Britain and Ireland conducted by Professors Rücker and Thorpe:

I. On the Accuracy of the Delineation of the Terrestrial Isomagnetic Lines.

II. On the Accuracy of the Determination of the Local Disturbing Magnetic Forces.

III. On the Relation between the Magnetic and the Geological Constitution of Great Britain and Ireland.

[b] Extracted from Terrestrial Magnetism, Vol. III, pp. 42–43.

"There is some ground for thinking that if these great underground wrinkles exist, they have affected the rocks which are superposed upon them, especially those which are of a comparatively early date. As a general rule, if older rocks appear in the midst of newer ones, the pole of the magnet will be attracted toward the protruding mass; but this rule holds good only of the rocks of Carboniferous or Pre-Carboniferous age, and does not apply to later deposits. As a striking example, I may state that the Pennine Range—which is sometimes called the "backbone of England"—is a mass of millstone grit rising amid younger rocks. Down this a well-marked magnetic ridge line runs. Similarly, in the neighborhood of Birmingham, the Dudley and Nuneaton coal fields are surrounded by more modern deposits. A curious horseshoe-shaped ridge line connects these two, and then runs south to Reading, which is, magnetically speaking, one of the most important towns in the Kingdom. East and west from Dover to Milford Haven, and then across the English Channel to Wexford, runs a ridge of the older rocks, called by geologists the Paleozoic ridge, concealed in many places by newer deposits. Hollowed out in this are the South Wales and Forest of Dean coal fields, and in another hollow within it lies the coal which has recently been discovered at Dover. Closely following this protruding mass of the older rocks is a magnetic ridge line which passes through Reading, and thus we have a magnetic connection between the anticlinals of Warwickshire and the Paleozoic ridge. From the neighborhood of Reading also another magnetic ridge line runs southward, entering the channel near Chichester. M. Moureaux, who, with most untiring energy, has for many years been investigating, single handed, the magnetic constitution of France, has discovered the continuation of this line on the French coast near Dieppe, and has traced it through the north of France to some 50 miles south of Paris. The energy which is now being displayed by magnetic surveyors in many countries will, no doubt before long, prove that the network of these magnetic ridge lines is universal, and the relations between them and the geological conformation of the countries in which they lie will be so studied that our inductions will be based upon an adequate knowledge of facts."

To give an intelligent and fair account of all work done in recent years in this special field of human activity would require far more space and time than is available. On the European continent, in nearly every country, elaborate magnetic surveys are either at present in progress or have just been finished or are in contemplation. One of the most detailed in recent years is that of Holland, by Dr. Van Rijckevorsel, for the epoch 1891.0, embracing 278 stations over an area about equal to that of Maryland, or averaging about one station to every 40 square miles. This survey of Holland is especially interesting from the fact that though it was made over an area *superficially* destitute of striking geological features, it nevertheless revealed marked disturbances. The author sums up his conclusions thus: "Little even as we know about the geology of the Netherlands, the magnetic maps must bring every one to the conviction that in some cases, in many perhaps, there must be a direct relation between geology and terrestrial magnetism, and that many of the magnetic features must be in some way determined by the geological structure of the underground. What these geological features might be we are at present unable to tell. What kinds of rock may be hidden at a depth of 300 meters or more under the peat bogs and heaths of the Netherlands, and the clay, sand, and pebbles immediately underlying these, we do not know—rocks which, although under ground, are yet perhaps in some places so near the surface as to be an effective barrier against the inroads of the sea, which has fair play in other districts."

So, likewise, important and interesting results were obtained by Professor Liznar, who conducted the magnetic survey of Austria. The magnetic survey of most of the German States (for a second time, and on a more elaborate scale than during Lamont's time) is now in progress. The Russian Government has been planning a magnetic survey of its extensive domains, and it is hoped that the funds will soon be forthcoming.

Magnetic surveys of India and of Egypt are being undertaken under the auspices of the English Government. Instances could be multiplied in which good and important work has been accomplished by magnetic surveys, as, for example, in France, Italy, Belgium, Denmark, Norway and Sweden, etc.

Extremely interesting investigations in the greatly disturbed areas in Russia between Kursk and Odessa have been made by Leyst, Moureaux, and Passalskij.[a]

Enough has been given, however, to show that by undertaking similar work the United States is simply keeping in touch with a general movement that is manifesting itself most actively in the civilized world to-day. It is recognized that in the eager and impatient endeavor to unravel the mysteries of the celestial regions the terrestrial mysteries, manifesting themselves every moment, have been woefully neglected. The science of our Earth is still in its infancy, and the astronomer has been made painfully aware of the fact that more attention must be given to the study of the physical history of the planet. There is every evidence that a reaction in scientific thought in this regard has set in that is bound to grow, and it is most desirable that the United States should keep in line with this onward movement.

Magnetic Survey of the United States.

In concluding, brief reference to the history of terrestrial magnetism in the United States is made, so that one may form some opinion as to the place to be ascribed to this country in the development of magnetic surveys.

The earliest attempt at a detailed State magnetic survey appears to have been made by Prof. Alexander Dallas Bache in 1840–1843, just before he was called to the Superintendency of the Coast Survey. He called his survey a "Magnetic survey of Pennsylvania and parts of adjacent States." Observations were made at 22 points within Pennsylvania; they did not in every case embrace the three elements. Professor Bache made these observations during his summer vacations from 1840–1843 and at private expense.

When Bache became Superintendent of the Coast Survey magnetic work was incorporated in the work of the Survey. Since then magnetic observations have been made in every State of the Union by the Coast Survey, and the drawing of isomagnetic maps and the furnishing of the data for allowance for the secular change have become regular authorized functions of the Survey. The extension of the observations in such manner as would fulfill the modern requirements of a magnetic survey could not be undertaken until 1899, when the United States Congress, acting upon the recommendation of Dr. Henry S. Pritchett, then Superintendent of the Coast and Geodetic Survey, largely increased the appropriation which had been made for magnetic observations before that date.

An officer of the Survey was placed in immediate charge of the details of the work in the field as Inspector of Magnetic Work, a division of Terrestrial Magnetism was created in the Office of the Survey, and operations were extended to the limit fixed by the amount of money available.

Magnetic observations, more or less complete, and magnetic tours, more or less extensive, had been made previous to Bache's work, referred to above, e. g., by Long

[a] See Terrestrial Magnetism, Vol. IV, p. 235, and Vol. VII, No. 2.

(1819), Nicollet (1832–36), Locke (1838–43) and Loomis (1838–41). The last made the first general collection of magnetic observations for this country and has the honor of having drawn the first magnetic maps. To be sure, these maps, covering the eastern part of the United States, owing to the scantiness of the material, were only rough approximations; nevertheless, when, sixteen years later, a more complete map was made by the Coast Survey, Professor Bache declared that between his own map and that of Loomis, when proper allowance was made for the secular change, the "agreement was remarkable." This epoch of about 1840 is remarkable for the number of zealous and devoted students of terrestrial magnetism among the famous scientists in the United States. It is hoped that before long some of the physicists of this country can again be counted in the list of eminent magneticians.

From 1878–1883 Prof. Francis E. Nipher, professor of physics at Washington University, St. Louis, undertook a detailed magnetic survey of Missouri. Professor Nipher must be duly credited with the spirit and enterprise he exhibited in the inauguration of this survey. He was dependent entirely upon private aid for the defraying of the expenses of the work. The instruments were loaned by the Coast and Geodetic Survey. Professor Nipher has published thus far five reports of this work[a]. He has, however, not been able to complete the survey, and so no final report and no maps have been published. He had observed, with the aid of assistants, at 149 stations, or on the average at one station to 438 square miles.

At the same time some preliminary observations appear to have been made by Prof. Gustav Hinrichs, in Iowa, but the survey does not seem to have progressed far beyond a beginning.

Next comes the declination survey carried out—this time under State auspices—under the direction of Prof. George H. Cook, then State geologist of New Jersey, now deceased. The period of the survey was 1887–1890, all the observations to the extent of 158 stations having been made within a few years of this date. There was thus on the average one declination station to about 52 square miles. The observations were not made with special magnetic instruments, but good surveying transits were used. The observers appear to have executed the work as carefully as the methods and instruments would permit.

It was a commendable piece of work, as far as it went, but it was not complete. In order to derive the full benefit from magnetic surveys, it is absolutely essential to determine not declination alone, but also dip and intensity. Experience has repeatedly shown that with proper instruments a skilled observer can determine the three magnetic elements at practically the same cost in money and time as when declination results alone are determined. The principal expense and labor occurs in getting to a station and determining the *true* meridian. After this, the magnetic work, with proper instruments and modern methods, can be expeditiously and economically performed.

In 1896 the State Geologist of Maryland, Prof. W. B. Clark, inaugurated a magnetic survey of Maryland, and intrusted it to the writer. The work was done principally in the summer months of 1896 and 1897 and in the spring of 1899, the expense being borne by the State of Maryland, except in 1899, when the expenses were divided between the State and the Coast and Geodetic Survey. In 1900 all of the expenses

[a] Transactions of the St. Louis Academy of Sciences, 1878–1886.

were borne by the Coast and Geodetic Survey, and the instruments used throughout the work (1896–1900) were loaned by this Survey. This work has resulted in giving Maryland the most detailed magnetic survey of any State, there being on the average one station to about 100 square miles. Holland is the only country which excels Maryland in this respect, having, on the average, one station to every 45 square miles. The results have been published in two Reports by the Maryland Geological Survey. A number of interesting facts have been revealed, especially in the locally disturbed areas; it has been amply demonstrated that if the geologist desires to invoke the aid of magnetism in the solution of some of the vexed problems with reference to subterranean formations at depths impenetrable by ordinary means, he must use approved magnetic methods, and not be content with instruments which admit of simply "ordinary" accuracy.

A magnetic survey of North Carolina was made between 1898 and 1899, by J. B. Baylor, of the Coast and Geodetic Survey, under the joint auspices of the Coast and Geodetic Survey and the North Carolina Geological Survey (Prof. J. A. Holmes, State Geologist). The "General Report" of this work, prepared by Messrs. Baylor and Hazard, will be found in Appendix 9, Coast and Geodetic Survey Report for 1898–99. (See also Bulletin No. 41.)

As stated above, since 1899 the Coast and Geodetic Survey has been enabled to undertake systematically a magnetic survey of the territory under the jurisdiction of the United States.[a] The general plan on which the magnetic survey is being conducted has been published in Appendix 10, Coast and Geodetic Survey Report for 1898–99.

It is the intention to make first a general survey with stations about 25–30 miles distant and to occupy between 400–500 stations a year. After the general survey has been completed additional stations will be placed where most needed, as, for example, in the locally disturbed areas revealed by the general survey. Also, besides the continuous observations at the magnetic observatory stations, the magnetic elements will be redetermined at a number of well-chosen and uniformly distributed places from time to time, in order to determine the amount of secular change, and thus make it possible to keep the magnetic charts up to date. For fuller information refer to the Appendix cited.

---

[a] The areas of the countries at present belonging to or under the jurisdiction of the United States are, approximately, as follows:

	Square miles.
United States	3 025 600
Alaska	577 390
Philippine Islands	118 600
Hawaiian Islands	6 500
Porto Rico	3 435
Guam Island, Tutuila Island, and Midway Islands	220
Total	3 731 745

The area controlled by the United States is equal to that of Europe, or about one-fifteenth of the entire land area of the globe.

THE EARTH'S MAGNETIC POLES AND MAGNETIC MOMENT.

MAGNETIC POLES.

The definition for the magnetic poles of the Earth commonly accepted, is that they are the points on the Earth's surface where the dipping needle stands precisely vertical, i. e., where the dip is 90°, at the north magnetic pole, the north end of the dipping needle pointing vertically downwards, and at the south magnetic pole, the south end of the same needle pointing vertically downwards. Excluding "local magnetic poles,"[a] caused by extraordinary local deposits of attracting masses, there are but two such points, one in the Northern Hemisphere and the other in the Southern Hemisphere; their approximate positions will be presently given, and it will be seen that they are not diametrically opposite each other. At these points, as all of the Earth's magnetic force acts vertically downwards, there is no horizontal component to act on the compass needle and hold it in any fixed direction, hence the compass needle at the magnetic poles, except for extraneous disturbing influences, remains in any position it may be placed.

The points of greatest intensity of the total magnetic force, because of the irregular way in which the Earth is magnetized, are not coincident with the magnetic poles as above defined; barring out local manifestations there will be found to be four such points, two in each hemisphere, termed the "foci of greatest magnetic intensity." The stronger of the two intensity foci in the Northern Hemisphere, was, according to Lefroy's observations in 1843–44, in latitude 52° 10′ north and in longitude 99° 59′ west of Greenwich, hence somewhat south of Hudsons Bay and considerably south of the north magnetic pole.

It can not too clearly be pointed out that the points on the Earth's surface termed "magnetic poles," are by no means to be compared to the poles of a bar magnet. If they were similar in their action, then, manifestly, the weight of iron particles ought to increase enormously with approach to the magnetic poles. This, however, is known not to be the case. The increase in the weight of iron as the pole is approached, on account of the increase of the vertical force of the Earth's magnetism, would only be about one-eighth of that due to the well-known increase of gravitational force ($\frac{1}{289}$) because of the flattening of the Earth at its rotation poles. The Earth is a *spherical* magnet, and not at all to be likened to a bar magnet. A bar magnet at the center of the Earth which would produce the magnetic facts observed on our globe would have its magnetic poles practically coincident with each other. Two well-known investigators, Kraft and Biot, found that the nearer to each other they assumed the poles of a fictitious bar magnet placed at the center of the Earth to be, the closer the correspondence between their computed results on this hypothesis and the observed facts; so that the "equivalent magnetic poles of a spherical magnet" are practically the same distance from all points on the Earth's surface, and this accounts for the very slight increase in the weight of iron which might be expected if it were carried from the "magnetic equator" to the "magnetic pole."

[a] A "local magnetic pole" was found by Messrs. Leyst and Moureaux in Russia, between Kursk and Odessa; the writer in the fall of 1900 found one near Juneau, Alaska, viz, on Douglass Island, opposite Sheep Creek. There are a number of such "local" poles.

Hence there are no points on or near the Earth's surface equivalent in their action to the poles of a bar magnet; the points which are termed the "magnetic poles of the Earth" are simply the points of intersection of the direction of vertical dip with the Earth's surface.

If the Earth were uniformly magnetized throughout instead of being heterogeneously magnetized, the line joining the "equivalent magnetic poles," if prolonged, would pass through the points on the Earth's surface where the dip is equal to 90°, and this line would be the "magnetic axis" of the Earth. Only about seven-tenths of the total force of the Earth's magnetism can be referred to a homogeneous magnetization, the remainder being due to irregular magnetizations. Hence we must expect neither that the points of vertical dip lie diametrically opposite to each other nor that the magnetic axis of the uniform magnetization should coincide with the straight line connecting them. The said magnetic axis passes through the Earth's center and connects the points on the surface, lying respectively in latitude 78°.3 north, longitude 67°.3 west, and in latitude 78°.3 south, longitude 112°.7 east, while the straight line connecting the magnetic poles does not pass through the center of the Earth but off to one side.

In consequence of the heterogeneous magnetization of the Earth a magnetic meridian line is not a straight line leading to the magnetic poles, but a very devious line indeed. And thus a great circle passed through the direction pointed out by a compass needle at any given place will not pass through the magnetic poles, and the opposite intersections of two of such circles will not coincide with the magnetic poles.

It is desirable to advert to one more matter before proceeding to give the position of the "magnetic poles." Gauss defined these points as the places of minimum and of maximum potential, the former being the north magnetic pole. The points so defined would coincide with those of vertical dip, if no part of the Earth's magnetism be due to electric currents which pass from the air into the earth and *vice versa*. It would seem as though we have some indication that a small part (about 2 or 3 per cent) of the Earth's magnetic force is to be ascribed to such currents.

Capt. James Clark Ross, in June, 1831, found that the dip of the needle at a place whose latitude was 70° 05′ 17″ north and whose longitude was 96° 45′ 48″ west of Greenwich was 89° 59′.5. The compass needle had lost its directive force at this point entirely; when suspended by a fiber it would remain in any position in which it had been placed. This point, reached for the first time by Ross and designated the "North Magnetic Pole," is situated on Boothia Felix—named in honor of Felix Booth, who had fitted out the expedition. Owing to the method of determination which Ross had to employ and the inaccuracy of his instruments, the position found for the magnetic pole must be regarded as only approximate. To fix the point precisely would require the magnetic survey of a considerable area, and hence the expenditure of more time than Ross could afford.

A Norwegian, Mr. Roald Amundsen, is at present planning a north magnetic pole expedition, which is to set out in the spring of 1903, and is to be equipped for a stay of four years in the region of the magnetic pole. His magnetic instruments are being constructed especially for this expedition under the able superintendence of Professor Neumayer, director of the German Naval Observatory at Hamburg, and Dr. Chree, superintendent of Kew Observatory, England.

The change in the magnetic inclination—the element principally involved in the location of the magnetic pole—along a magnetic meridian is in this region about 0′.8 to 2′ per kilometer, or 1′ to 3′ per mile. It is furthermore probable that the magnetic pole is at present moving, because of the secular change in the Earth's magnetism in a northwesterly direction at the rate of about 5–8 kilometers, or 8–13 miles, per year.

It would accordingly seem that with modern instrumental means and methods the

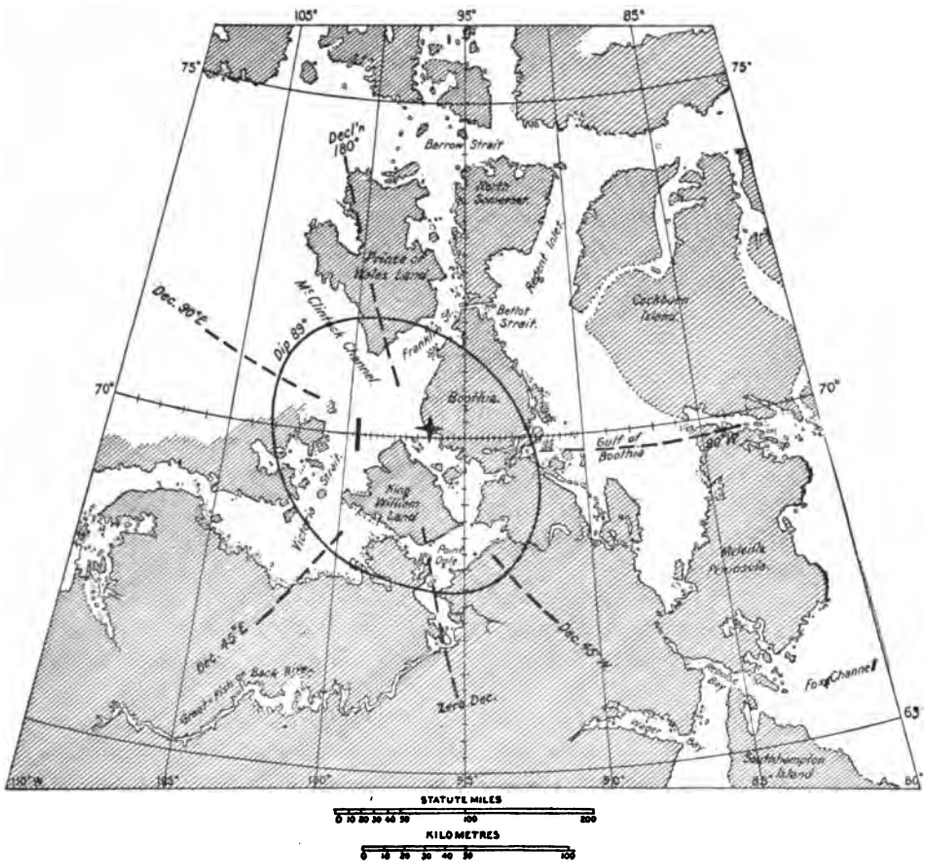


FIG. 26.—Map of region around North Magnetic Pole (Schott, 1890).

location of the magnetic pole, defined as the focus of vertical dip, and its secular motion, ought to be determinable with sufficient accuracy within the period of the expedition.

Observations of the diurnal variation of the magnetic elements, if possible, of magnetic perturbations, polar lights, and atmospheric electricity will be extremely interesting and valuable in this region.

The south magnetic pole has not as yet been reached. From Ross's observations, made in the antarctic regions while in command of the ship *Erebus*, Duperrey has deduced the position of 75° south and 138° east of Greenwich. The nearest approach to the

south magnetic pole was made by Ross, February 16, 1841, in latitude 76° 20′ south and longitude 165° 32′ east, the dip at this place being 88° 35′. Unsurmountable physical difficulties prevented his getting any nearer.

Duperrey determined the position of the magnetic poles with the aid of his charts of the magnetic meridians for 1836. (See Fig. 23.) These meridians do not quite meet in the same point because of the irregularity in the Earth's magnetization, as already pointed out; however, the "successive intersection of each pair of contiguous meridians form a closed curve, the central points of which may be denominated magnetic poles." The poles so defined were found to be in 70° north, 98° west, and 75° south and 138° east. Gauss, in 1838, calculated that the north magnetic pole would be in 73° 35′ north and 93° 39′ west, and the south magnetic pole in 72° 35′ south and 152° 30′ east. Commander Borchgrevink, who has penetrated the farthest south thus far, claims that the position of the south magnetic pole, computed (he did not reach the pole) from his magnetic observations, gives a position agreeing more closely with that of Gauss than that of Ross. Enough has been given to show, however, that the positions of the magnetic poles are not as yet accurately known, and that, furthermore, any position determined applies only to a particular time.

Magnetic Moment.

The following figures are given to furnish some slight conception of the magnetic moment of the Earth. Suppose as the unit, a bar magnet of the hardest steel, magnetized as strongly as possible, which shall be 14 inches long, 1 inch wide, 1¼ inches thick. Such a bar magnet would weigh 1 pound. According to Gauss, it would take the following number of these bar magnets placed at the Earth's center to produce the same external effect as the Earth:

8 464 000 000 000 000 000 000.

Or, if we assume that the Earth's magnetism is uniformly distributed throughout the Earth, then will the magnetic intensity of each cubic yard be equal to six of the 1-pound steel magnets.

To put the same fact in still another form. The radius of a soft iron sphere magnetized to saturation and concentric with the Earth, which shall have the same magnetic effect as that of the Earth, is, according to Overbeck, 243.2 kilometers, or 132.4 geographical miles, or 151 statute miles, or one-twenty-sixth of the Earth's radius.

According to Gray ("Treatise on Magnetism and Electricity," 1898): "Certain long bars of steel of comparatively high magnetizability have been found by the author to take a magnetic moment of about 780 per cubic centimeter (that is, an induction in the steel of over 10 000, about four and one-half times that taken by Gauss's bar). Consequently, the magnetic moment of a cubic centimeter of such steel is about ten times as great as that of a cubic decimeter of the Earth—that is, the mean magnetization intensity of the Earth's substance is about $\frac{1}{10\,000}$ of that of very highly magnetized hard steel."

Fleming says ("Terrestrial Magnetism," Vol. II, p. 58):

"Taken as a whole, the Earth is a feeble magnet. If our globe were wholly made of steel and magnetized as highly as an ordinary steel-bar magnet, the magnetic forces at its surface would be at least a hundred times as great as they are now. That might be an advantage or a very great disadvantage."

In conclusion, it may be well to point out that the actual distribution and location of the magnetic masses or systems of electric currents within the Earth's crust which cause the observed magnetic facts on the globe can not be definitely determined until observations in sufficient number and of the required accuracy have been made not only on the surface, but also at various altitudes and depths—in the upper regions and in the ocean depths. The facts measured and observed simply on the surface can be explained in an infinite number of ways.

All modern investigations would seem to lead to the conclusion that there exists both a very deep-seated magnetic field and one confined to a comparatively thin layer, and that the Earth's total magnetism results from systems of electric currents as well as from permanent and induced magnetizations.

DETERMINATION OF THE TRUE MERIDIAN AND THE MAGNETIC DECLINATION.

DETERMINATION OF THE TRUE MERIDIAN.

Such methods as can be employed with the means usually at a surveyor's disposal are described first, and then the method generally used by the magnetic observers of the Coast and Geodetic Survey is given.

Simple Methods for Determining the True Meridian by Observations on Polaris.[a]

I.—To determine the true meridian by observation on Polaris at elongation with a surveyor's transit.

1. Set a stone, or drive a wooden plug, firmly in the ground and upon the top thereof make a small distinct mark.

2. About thirty minutes before the time of the eastern or western elongation of Polaris, as given by the tables of elongation, No. VII, set up the transit firmly, with its vertical axis exactly over the mark, and carefully level the instrument.

3. Illuminate the cross hairs by the light from a bull's-eye lantern or other source, the rays being directed into the object end of the telescope by an assistant. Great care should be taken to see that the line of collimation describes a truly vertical plane.

4. Place the vertical hair upon the star, which, if it has not reached its elongation, will move to the right for eastern and to the left for western elongation.

5. As the star moves toward elongation, keep it continually covered by the vertical hair by means of the tangent screw of the vernier plate, until a point is reached where it will appear to remain on the hair for some time and then leave it in a direction contrary to its former motion, thus indicating the point of elongation.

6. At the instant the star appears to thread the vertical hair, depress the telescope to a horizontal position; about 100 yards north of the place of observation drive a wooden plug, upon which by a strongly illuminated pencil or other slender object, exactly coincident with the vertical hair, mark a point in the line of sight thus determined; then *quickly* revolve the vernier plate 180°, again place the vertical hair upon the star, and, as before, mark a point in the new direction; then the middle point between the two marks, with the point under the instrument, will define on the ground the trace of the vertical plane through Polaris at its eastern or western elongation, as the case may be.

7. By daylight lay off to the east or west, as the case may require, the proper azimuth taken from the Table No. VIII; the instrument will then define the *true meridian*, which may be permanently marked by monuments for future reference.

[a] In the preparation of this article use has been made of the United States Land Office Manual of Instructions, Washington, 1896.

TABLE VII.—*Local mean (astronomical) time of the culminations and elongations of Polaris in the year 1902.*

[Computed for latitude 40° north and longitude 90° or 6h west of Greenwich.]

Date	East elongation	Upper culmination	West elongation	Lower culmination
1902	h m	h m	h m	h m
January 1	0 45.8	6 40.6	12 35.3	18 38.7
January 15	23 46.6	5 45.3	11 40.0	17 43.4
February 1	22 39.5	4 38.2	10 32.9	16 36.3
February 15	21 44.2	3 42.9	9 37.7	15 41.0
March 1	20 49.0	2 47.7	8 42.4	14 45.8
March 15	19 54.0	1 52.7	7 47.3	13 50.7
April 1	18 47.0	0 45.6	6 40.3	12 43.7
April 15	17 52.0	23 46.7	5 45.3	11 48.6
May 1	16 49.1	22 43.8	4 42.5	10 45.7
May 15	15 54.2	21 48.9	3 47.6	9 50.8
June 1	14 47.5	20 42.3	2 40.9	8 44.2
June 15	13 52.6	19 47.4	1 46.0	7 49.3
July 1	12 50.0	18 44.8	0 43.4	6 46.7
July 15	11 55.1	17 49.9	23 44.6	5 51.8
August 1	10 48.6	16 43.4	22 38.0	4 45.3
August 15	9 53.7	15 48.5	21 43.1	3 50.4
September 1	8 47.1	14 41.9	20 36.5	2 43.8
September 15	7 52 2	13 47.0	19 41.6	1 48.9
October 1	6 49.3	12 44.1	18 38.7	0 46.0
October 15	5 54.3	11 49.1	17 43.7	23 47.2
November 1	4 47.5	10 42.3	16 36.9	22 40.4
November 15	3 52.3	9 47.1	15 41.8	21 45.2
December 1	2 49.3	8 44.1	14 38.8	20 42.2
December 15	1 54.0	7 48.8	13 43.6	19 46.9

A. *To refer the above tabular quantities to years subsequent to 1902:*

For year 1903	add	1.4 minutes	
1904	add	2.8 "	up to March 1
	subtract	1.1 "	on and after March 1
1905	add	0.2 "	
1906	"	1.5 "	
1907	"	2.9 "	
1908	"	4.2 "	up to March 1
	"	0.3 "	on and after March 1
1909	"	1.7 "	
1910	"	3.0 "	

B. *To refer to any calendar day other than the first and fifteenth of each month,* SUBTRACT *the quantities below from the tabular quantity for the* PRECEDING DATE.

Day of month	Minutes	No. of days elapsed
2 or 16	3.9	1
3 17	7.9	2
4 18	11.8	3
5 19	15.8	4
6 20	19.7	5
7 21	23.6	6
8 22	27.6	7
9 23	31.5	8
10 24	35.5	9
11 25	39.4	10
12 26	43.3	11
13 27	47.3	12
14 28	51.2	13
29	55.2	14
30	59.1	15
31	63.0	16

C. *To refer the table to Standard time and to the civil or common method of reckoning:*

(^{a}) ADD to the tabular quantities four minutes for every degree of longitude the place is west of the Standard meridian and SUBTRACT when the place is east of the Standard meridian.

(^{b}) The astronomical day begins twelve hours after the civil day, i. e., begins at noon on the civil day of the same date, and is reckoned from 0 to 24 hours. Consequently an astronomical time less than twelve hours refers to the same civil day, whereas an astronomical time greater than twelve hours refers to the morning of the next civil day.

It will be noticed that for the tabular year two eastern elongations occur on January 12 and two western elongations on July 12. There are also two upper culminations on April 12 and two lower culminations on October 12. The lower culmination either follows or precedes the upper culmination by $11^h\ 58^m.1$.

D. *To refer to any other than the tabular latitude between the limits of 25° and 50° North:* ADD to the time of west elongation $0^m.13$ for every degree south of 40° and SUBTRACT from the time of west elongation $0^m.18$ for every degree north of 40°. Reverse these operations for correcting times of east elongation.

E. *To refer to any other than the tabular longitude:* ADD $0^m.16$ for each 15° east of the ninetieth meridian and SUBTRACT $0^m.16$ for each 15° west of the ninetieth meridian.

27478—02——6

TABLE VIII.—*Azimuth of Polaris when at elongation for any year between 1902 and 1910.*

Latitude	1902.0	1903.0	1904.0	1905.0	1906.0	1907.0	1908.0	1909.0	1910.0
	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
25°	1 20.5	1 20.1	1 19.8	1 19.4	1 19.1	1 18.7	1 18.4	1 18.1	1 17.7
26	21.1	20.8	20.5	20.1	19.8	19.4	19.1	18.7	18.4
27	21.9	21.5	21.2	20.8	20.5	20.1	19.8	19.4	19.1
28	22.6	22.2	21.9	21.6	21.3	20.9	20.5	20.1	19.8
29	23.4	23.0	22.7	22.4	22.1	21.7	21.3	20.9	20.5
30	24.2	23.9	23.5	23.1	22.8	22.4	22.1	21.7	21.3
31	25.1	24.7	24.4	24.0	23.6	23.2	22.9	22.5	22.2
32	26.0	25.6	25.3	24.9	24.5	24.1	23.8	23.4	23.1
33	27.0	26.6	26.2	25.9	25.5	25.1	24.7	24.3	24.0
34	28.0	27.6	27.2	26.9	26.5	26.1	25.7	25.3	25.0
35	29.0	28.7	28.3	27.9	27.5	27.1	26.8	26.4	26.0
36	30.1	29.8	29.4	29.0	28.6	28.2	27.9	27.5	27.1
37	31.3	30.9	30.5	30.1	29.7	29.3	29.0	28.6	28.2
38	32.6	32.2	31.8	31.4	31.0	30.6	30.2	29.8	29.4
39	33.9	33.5	33.1	32.7	32.3	31.8	31.4	31.0	30.6
40	35.2	34.8	34.4	34.0	33.6	33.2	32.8	32.4	32.0
41	36.7	36.2	35.8	35.4	35.0	34.6	34.2	33.8	33.4
42	38.2	37.7	37.3	36.9	36.5	36.0	35.6	35.2	34.8
43	39.8	39.3	38.9	38.5	38.1	37.6	37.2	36.8	36.3
44	41.4	41.0	40.5	40.1	39.7	39.2	38.8	38.4	37.9
45	43.2	42.7	42.3	41.8	41.4	40.9	40.5	40.1	39.6
46	45.0	44.6	44.2	43.7	43.2	42.7	42.3	41.9	41.4
47	46.9	46.5	46.0	45.6	45.1	44.6	44.2	43.7	43.3
48	49.0	48.6	48.1	47.7	47.2	46.7	46.3	45.8	45.3
49	51.2	50.7	50.2	49.8	49.3	48.8	48.4	47.9	47.4
50	1 53.5	1 53.0	1 52.5	1 52.0	1 51.5	1 51.0	1 50.6	1 50.1	1 49.6

The above table was computed with mean declination of Polaris for each year. A more accurate result will be had by applying to the tabular values the following correction, which depends on the difference of the mean and the apparent place of the star. The deduced azimuth will in general be correct within 0′.3.

For Middle of	Correction ′	For Middle of	Correction ′
January,	−0.4	July,	+0.3
February,	−0.3	August,	+0.1
March,	−0.2	September,	−0.1
April,	0.0	October,	−0.3
May,	+0.2	November,	−0.6
June,	−0.3	December,	−0.8

II.—TO DETERMINE THE TRUE MERIDIAN BY OBSERVATION ON POLARIS AT ELONGATION WITH A PLUMB LINE AND PEEP SIGHT.

1. Attach the plumb line to a support situated as far above the ground as practicable, such as the limb of a tree, a piece of board nailed or otherwise fastened to a telegraph pole, a house, barn, or other building affording a clear view in a north and south direction.

The plumb bob may consist of any weighty material, such as a brick, a piece of iron or stone, weighing 4 to 5 pounds, which will hold the plumb line straight and vertical fully as well as one of turned and finished metal.

Strongly illuminate the plumb line just below its support by a lamp or candle, care being taken to obscure the source of light from the view of the observer by an opaque screen.

For a peep sight, cut a slot about one-sixteenth of an inch wide in a thin piece of board, or nail two strips of tin, with straight edges, to a square block of wood, so arranged that they will stand vertical when the block is placed flat on its base upon a smooth horizontal rest, which will be placed at a convenient height south of the plumb line and firmly secured in an east and west direction, in such a position that when viewed through the peep sight Polaris will appear about a foot below the support of the plumb line.

The position may be determined by trial the night preceding that set for the observation.

About thirty minutes before the time of elongation, as given in the tables of elongation, bring the peep sight into the same line of sight with the plumb line and Polaris.

To reach elongation the star will move off the plumb line to the east for eastern elongation, or to the west for western elongation; therefore by moving the peep sight in the proper direction, east or west, as the case may be, keep the star on the plumb line until it appears to remain stationary, thus indicating that it has reached its point of elongation.

The peep sight will now be secured in place by a clamp or weight, and all further operations will be deferred until the next morning.

4. By daylight place a slender rod at a distance of 200 or 300 feet from the peep sight and exactly in range with it and the plumb line; carefully measure this distance.

Take from the Table VIII the azimuth of Polaris corresponding to the latitude of the station and year of observation; find the natural tangent of said azimuth and multiply it by the distance from the peep sight to the rod; the product will express the distance to be laid off from the rod *exactly at right angles* to the direction already determined (to the *west* for eastern elongation or to the *east* for western elongation) to a point which with the peep sight will define the direction of the *true meridian* with a fair degree of accuracy.

III.—TO DETERMINE THE TRUE MERIDIAN BY OBSERVING THE TRANSITS OF POLARIS AND ANOTHER STAR ACROSS THE SAME VERTICAL PLANE.

This simple method for tracing out on the ground a true north and south line, one demanding only a very slender instrumental outfit, was given in Lalande's Astronomy, published more than a century ago. It was used by Andrew Ellicott in 1785 in his boundary survey work of Pennsylvania, and was again brought to notice in the present century by Dr. Charles Davies. It consists in watching for the time when Polaris and a given bright star come to the same vertical, and then after a short lapse of time, given in a table, Polaris will be found exactly on the meridian, and hence can be referred to the horizon and to any meridian mark placed there.

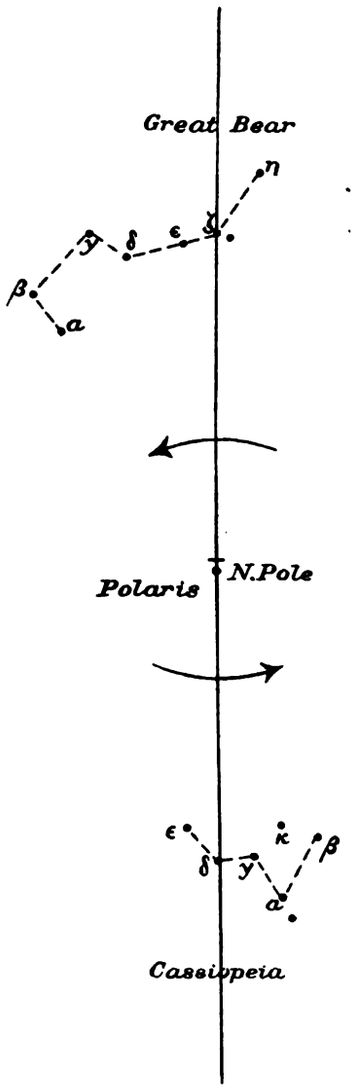


FIG. 27.—The diagram held perpendicular to the line of sight directed to the pole, with the right-hand side of the page uppermost, will represent the configuration of the constellations with Polaris near *eastern* elongation at midnight about July 11. *Inverted*, it will show Zeta (ζ) of the Great Bear and Polaris on the meridian (the former *below* and the latter *above* the pole) at midnight about October 10; and held with left-hand side uppermost, the diagram will indicate the relative situations for midnight about January 8, with Polaris near *western* elongation. The arrows indicate the direction of apparent motion.

The verticality may be ascertained by a plumb line or by the vertical thread of a transit instrument; the method demands neither a graduated circle, nor a chronometer, nor any *exact* knowledge of the local time, an ordinary watch being sufficient to measure the short tabular interval.

Early in the present century the star Alioth (ε Ursæ Majoris) was favorably situated for the use of the method; however, in 1850 the interval between times of verticality and of culmination already amounted to 17 minutes, and at the present time has become so large that this star is no longer suitable. Zeta (ζ) Ursæ Majoris or Delta (δ) Cassiopeiæ should now be substituted for it, both these stars being now in very favorable positions. Zeta (ζ) Ursæ Majoris, or Mizar, as it was called by the ancient Arabians, is the middle one of the three stars in the tail of the Great Bear; the small star near it is Alcor. Delta (δ) Cassiopeiæ is at the bottom of the less perfectly formed V of the letter W, as frequently imagined to unite roughly the five brightest stars of this constellation.

The diagram (Fig. 27), drawn to scale, exhibits the principal stars of the constellations Cassiopeia and Great Bear, with Delta (δ) Cassiopeia, Zeta (ζ) of the Great Bear, and *Polaris* on the meridian, represented by the straight line, Polaris being at *lower* culmination.

In employing this method the following instructions may be followed:

1. Select that one of the two stars which at the time of the year when the observation is made passes the meridian *below* Polaris. When the star passes the meridian above the pole it is too near the zenith to be of service. Delta (δ) Cassiopeiæ is on the meridian below Polaris and the pole at midnight about April 10, and is, therefore, the proper star to use at that date and for some two or three months before and after. Six months later the star Zeta (ζ) Ursæ Majoris will supply its place.

2. Using the apparatus just described under II, place the "peep sight" in the line with the plumb line and Polaris, and move it to the *west* as Polaris moves *east*, until Polaris and δ Cassiopeia, for example, *appear upon the plumb line together*, and carefully note the time by a clock or watch; then by moving the peep sight, preserve the alignment with *Polaris* and the *plumb line*

(paying no further attention to the other star); at the expiration of the small interval of time given below the *peep sight* and *plumb line* will define the *true meridian*, which may be permanently marked for future use.

		Annual increase.
For Zeta (ζ) Ursæ Majoris in 1900	+2.6 minutes	0.35 minute.
For Delta (δ) Cassiopeiæ in 1900	+3.4 "	0.33 "

The method given in this article for finding the true meridian can not be used with advantage at places below about 38° north latitude, on account of the haziness of the atmosphere near the horizon.

The foregoing methods for the determination of the true meridian are excellent and when available they answer the requirements of the surveyor and give results with all desirable precision. They do not require an accurate knowledge of the time, which is their principal advantage. The relative motion of the stars employed in the third method and the change in direction of motion of Polaris at elongation indicate with sufficient exactness the moment when the observation should be made. Stormy weather, a hazy atmosphere, or the presence of clouds may interfere or entirely prevent observation when the star is either at elongation or on the meridian, and both events sometimes occur in broad daylight or at an inconvenient hour of the night. Under such circumstances a simple method applicable at any time (Polaris being visible) is desirable and can often be used by the surveyor when other methods fail.

IV.—TO DETERMINE THE TRUE MERIDIAN BY MEANS OF AN OBSERVATION OF POLARIS AT ANY HOUR WHEN THE STAR IS VISIBLE, THE CORRECT LOCAL MEAN TIME BEING KNOWN.[a]

This method requires a knowledge of the local mean time within one or two minutes, as in the extreme case when Polaris is at culmination, its azimuth changes 1′ (arc) in 2½ minutes (time). The Standard time can usually be obtained at a telegraph office from the signals which are sent out from observatories. From this the local mean time may be derived by subtracting four minutes of time for every degree of longitude west of the Standard meridian or adding four minutes for every degree east of the Standard meridian. The local mean time may be obtained also by observations of the sun, one method being explained later.

The following table, IX, is intended to be used in connection with the American Ephemeris and Nautical Almanac. The surveyor should read carefully the chapter in that publication in which the formation and use of the Ephemeris are explained, especially the portion defining the different kinds of time.

[a] *cf.* Appendix No. 10, Coast and Geodetic Survey Report for 1895.

The following example explains the use of the table and the derivation of the hour angle of Polaris:

Position, latitude 36° 20′ N., longitude 80° 07′. 5 or $5^h\ 20^m\ 30^s$ W. of Greenwich.

		h.	m.	s.	
Time of observation, July 10, 1902, standard (75th mer.) mean time		8	52	40	p. m.
Reduction to local time		—	20	30	
Local mean time		8	32	10	
Reduction to sidereal time (Table III, Amer. Ephem.)		+	01	24	
Sidereal time mean noon, Greenwich, July 10, 1902		7	09	54	
Correction for longitude $5^h\ 20^m\ 30^s$ (Table III, Amer. Ephem.)		+	00	53	
Local sidereal time		15	44	21	
Apparent right ascension of Polaris, July 10, 1902		1	24	02	
Hour angle before upper culmination		9	39	41	
	° ′				
Declination for which Table IX applies	88 46				
Apparent declination, July 10, 1902	88 46.9				
Increase in declination	+ 0.9				
	° ′ ″				
Azimuth from Table IX (interpolated),	0 52 06				
Correction for 0′. 9 increase in declination	−38				
Computed azimuth	0 51 28	East of north.			

It is to be remembered that Polaris is east of the meridian for twelve hours before, and west of the meridian for twelve hours after, upper culmination.

Without the American Ephemeris the table may be conveniently used for obtaining the true meridian, in connection with Table VII giving the approximate mean times of culminations of Polaris, and the additional knowledge of the fact that the mean declination of Polaris was 88° 46′.5 in 1900 and is increasing at the rate of about 0′.3 per year. Without the use of the Ephemeris the computation would be as follows:

		h. m. s.	
Time of observation, July 10, 1902 standard (75th mer.) mean time		8 52 40	p. m.
Reduction to local mean time		— 20 30	
Local mean time		8 32 10	
Local mean time of upper culmination of Polaris (Table VII)		18 09 42	
Mean time of observation before upper culmination		9 37 32	
Reduction to sidereal time		+ 01 35	
Hour angle before upper culmination		9 39 07	
	° ′		
Declination for which Table IX applies	88 46		
Mean declination 1902	88 47.1		
Increase in declination	1.1		
	° ′ ″		
Azimuth from Table IX	0 52 19		
Correction for 1′.1 increase in declination	−46		
Computed azimuth	0 51 33	East of north.	

Tables are generally given in books on surveying for reducing mean solar to sidereal time, but for this computation it is near enough to consider the correction 10^s an hour, as the stars gain very nearly four minutes on the Sun each day.

TABLE IX.—*Azimuth of Polaris at any hour angle.*

Hour angle before or after upper culmination	Azimuth of Polaris computed for declination 88° 46′										Correction for 1′ increase in declination of Polaris	
	Latitude 30°	Latitude 31°	Latitude 32°	Latitude 33°	Latitude 34°	Latitude 35°	Latitude 36°	Latitude 37°	Latitude 38°	Latitude 39°	Latitude 40°	Latitude 30°	Latitude 40°
h m	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	″	″
0 15	0 05 40	0 05 43	0 05 47	0 05 51	0 05 55	0 06 00	0 06 05	0 06 10	0 06 15	0 06 20	0 06 26	− 5	− 5
0 30	0 11 18	0 11 25	0 11 33	0 11 41	0 11 49	0 11 58	0 12 08	0 12 18	0 12 28	0 12 39	0 12 50	− 9	−10
0 45	0 16 53	0 17 04	0 17 15	0 17 27	0 17 40	0 17 53	0 18 07	0 18 22	0 18 38	0 18 54	0 19 11	−14	−16
1 00	0 22 23	0 22 38	0 22 53	0 23 09	0 23 26	0 23 44	0 24 02	0 24 22	0 24 43	0 25 04	0 25 27	−18	−21
1 15	0 27 48	0 28 06	0 28 25	0 28 45	0 29 06	0 29 28	0 29 51	0 30 15	0 30 41	0 31 08	0 31 36	−23	−26
1 30	0 33 05	0 33 26	0 33 49	0 34 13	0 34 38	0 35 04	0 35 31	0 36 00	0 36 31	0 37 02	0 37 36	−27	−31
1 45	0 38 13	0 38 38	0 39 04	0 39 32	0 40 00	0 40 30	0 41 02	0 41 35	0 42 11	0 42 47	0 43 26	−31	−36
2 00	0 43 12	0 43 40	0 44 09	0 44 40	0 45 12	0 45 46	0 46 22	0 47 00	0 47 39	0 48 21	0 49 04	−35	−40
2 15	0 47 58	0 48 29	0 49 02	0 49 36	0 50 12	0 50 50	0 51 29	0 52 11	0 52 55	0 53 41	0 54 29	−39	−45
2 30	0 52 32	0 53 06	0 53 42	0 54 19	0 54 59	0 55 40	0 56 23	0 57 09	0 57 57	0 58 47	0 59 40	−43	−49
2 45	0 56 52	0 57 29	0 58 07	0 58 48	0 59 30	1 00 15	1 01 02	1 01 51	1 02 43	1 03 37	1 04 34	−46	−53
3 00	1 00 58	1 01 37	1 02 18	1 03 01	1 03 46	1 04 34	1 05 24	1 06 17	1 07 12	1 08 10	1 09 12	−50	−57
3 15	1 04 47	1 05 28	1 06 12	1 06 58	1 07 46	1 08 36	1 09 29	1 10 25	1 11 24	1 12 25	1 13 30	−53	−60
3 30	1 08 19	1 09 02	1 09 48	1 10 36	1 11 27	1 12 20	1 13 16	1 14 14	1 15 16	1 16 21	1 17 29	−56	−63
3 45	1 11 33	1 12 18	1 13 06	1 13 56	1 14 49	1 15 45	1 16 43	1 17 44	1 18 49	1 19 57	1 21 08	−58	−66
4 00	1 14 28	1 15 15	1 16 05	1 16 57	1 17 52	1 18 50	1 19 50	1 20 54	1 22 01	1 23 11	1 24 25	−61	−69
4 15	1 17 04	1 17 52	1 18 44	1 19 37	1 20 34	1 21 34	1 22 36	1 23 42	1 24 51	1 26 03	1 27 20	−63	−72
4 30	1 19 19	1 20 09	1 21 02	1 21 57	1 22 55	1 23 57	1 25 01	1 26 08	1 27 19	1 28 33	1 29 52	−64	−74
4 45	1 21 14	1 22 05	1 22 59	1 23 55	1 24 55	1 25 57	1 27 03	1 28 12	1 29 24	1 30 40	1 32 00	−66	−75
5 00	1 22 48	1 23 40	1 24 35	1 25 32	1 26 32	1 27 36	1 28 42	1 29 52	1 31 06	1 32 23	1 33 44	−68	−76
5 15	1 24 00	1 24 53	1 25 48	1 26 46	1 27 47	1 28 51	1 29 59	1 31 09	1 32 24	1 33 42	1 35 04	−69	−77
5 30	1 24 51	1 25 44	1 26 40	1 27 38	1 28 39	1 29 44	1 30 52	1 32 03	1 33 18	1 34 37	1 35 59	−69	−78
5 45	1 25 20	1 26 13	1 27 09	1 28 07	1 29 09	1 30 14	1 31 21	1 32 33	1 33 48	1 35 07	1 36 30	−70	−78
6 00	1 25 27	1 26 19	1 27 15	1 28 14	1 29 15	1 30 20	1 31 27	1 32 39	1 33 54	1 35 13	1 36 35	−70	−78
6 15	1 25 12	1 26 04	1 26 59	1 27 57	1 28 59	1 30 03	1 31 10	1 32 21	1 33 36	1 34 54	1 36 16	−69	−78
6 30	1 24 34	1 25 27	1 26 21	1 27 19	1 28 19	1 29 23	1 30 30	1 31 40	1 32 54	1 34 11	1 35 32	−68	−77
6 45	1 23 36	1 24 27	1 25 21	1 26 18	1 27 17	1 28 20	1 29 26	1 30 35	1 31 48	1 33 04	1 34 24	−67	−76
7 00	1 22 16	1 23 06	1 23 59	1 24 55	1 25 53	1 26 55	1 27 59	1 29 07	1 30 18	1 31 33	1 32 52	−66	−75
7 15	1 20 35	1 21 25	1 22 16	1 23 10	1 24 08	1 25 08	1 26 11	1 27 17	1 28 26	1 29 39	1 30 56	−65	−73
7 30	1 18 34	1 19 22	1 20 12	1 21 05	1 22 00	1 22 59	1 24 00	1 25 04	1 26 12	1 27 23	1 28 38	−64	−72
7 45	1 16 13	1 16 59	1 17 48	1 18 39	1 19 33	1 20 29	1 21 28	1 22 30	1 23 36	1 24 45	1 25 57	−62	−69
8 00	1 13 33	1 14 17	1 15 04	1 15 53	1 16 45	1 17 39	1 18 36	1 19 36	1 20 39	1 21 45	1 22 54	−60	−66
8 15	1 10 34	1 11 16	1 12 01	1 12 48	1 13 37	1 14 29	1 15 24	1 16 21	1 17 22	1 18 25	1 19 31	−57	−64
8 30	1 07 17	1 07 57	1 08 40	1 09 25	1 10 12	1 11 01	1 11 53	1 12 48	1 13 45	1 14 45	1 15 48	−54	−61
8 45	1 03 43	1 04 22	1 05 02	1 05 44	1 06 29	1 07 15	1 08 04	1 08 56	1 09 50	1 10 47	1 11 47	−51	−58
9 00	0 59 54	1 00 30	1 01 07	1 01 47	1 02 29	1 03 12	1 03 58	1 04 47	1 05 38	1 06 31	1 07 27	−48	−54
9 15	0 55 49	0 56 23	0 56 58	0 57 34	0 58 13	0 58 54	0 59 37	1 00 22	1 01 09	1 01 59	1 02 51	−45	−50
9 30	0 51 31	0 52 01	0 52 34	0 53 08	0 53 43	0 54 21	0 55 00	0 55 42	0 56 25	0 57 11	0 57 59	−42	−46
9 45	0 46 59	0 47 27	0 47 57	0 48 28	0 49 00	0 49 34	0 50 10	0 50 48	0 51 27	0 52 09	0 52 53	−38	−42
10 00	0 42 16	0 42 42	0 43 08	0 43 36	0 44 05	0 44 35	0 45 08	0 45 42	0 46 17	0 46 54	0 47 34	−34	−38
10 15	0 37 23	0 37 45	0 38 08	0 38 33	0 38 59	0 39 26	0 39 54	0 40 24	0 40 55	0 41 28	0 42 03	−30	−34
10 30	0 32 20	0 32 39	0 32 59	0 33 20	0 33 43	0 34 06	0 34 30	0 34 57	0 35 24	0 35 52	0 36 22	−26	−29
10 45	0 27 09	0 27 25	0 27 42	0 28 00	0 28 18	0 28 38	0 28 59	0 29 20	0 29 43	0 30 07	0 30 32	−22	−24
11 00	0 21 51	0 22 04	0 22 18	0 22 32	0 22 47	0 23 03	0 23 19	0 23 37	0 23 55	0 24 14	0 24 35	−18	−20
11 15	0 16 28	0 16 38	0 16 48	0 16 59	0 17 10	0 17 22	0 17 35	0 17 48	0 18 02	0 18 16	0 18 31	−13	−15
11 30	0 11 01	0 11 08	0 11 14	0 11 22	0 11 29	0 11 37	0 11 46	0 11 54	0 12 04	0 12 13	0 12 23	− 9	−10
11 45	0 05 31	0 05 34	0 05 38	0 05 42	0 05 45	0 05 49	0 05 53	0 05 58	0 06 02	0 06 07	0 06 12	− 4	− 5
Elongation: Azimuth	1 25 27	1 26 20	1 27 16	1 28 14	1 29 16	1 30 20	1 31 28	1 32 40	1 33 55	1 35 14	1 36 36	−69	−78
	h m s	h m s	h m s	h m s	h m s	h m s	h m s	h m s	h m s	h m s	h m s	s	s
Hour angle	5 57 09	5 57 02	5 56 55	5 56 48	5 56 40	5 56 33	5 56 25	5 56 17	5 56 09	5 56 00	5 55 52	+ 2	+ 3

TABLE IX.—*Azimuth of Polaris at any hour angle*—Concluded.

Hour angle before or after upper culmination	Azimuth of Polaris computed for declination 88° 46′											Correction for 1′ increase in declination of Polaris	
	Latitude 40°	Latitude 41°	Latitude 42°	Latitude 43°	Latitude 44°	Latitude 45°	Latitude 46°	Latitude 47°	Latitude 48°	Latitude 49°	Latitude 50°	Latitude 40°	Latitude 50°
h m	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	″	″
0 15	0 06 26	0 06 32	0 06 39	0 06 45	0 06 52	0 07 00	0 07 08	0 07 16	0 07 25	0 07 34	0 07 44	− 5	− 6
0 30	0 12 50	0 13 03	0 13 15	0 13 29	0 13 43	0 13 58	0 14 13	0 14 30	0 14 48	0 15 06	0 15 25	−10	−13
0 45	0 19 11	0 19 30	0 19 48	0 20 08	0 20 29	0 20 52	0 21 15	0 21 40	0 22 06	0 22 33	0 23 02	−16	−19
1 00	0 25 27	0 25 51	0 26 16	0 26 43	0 27 10	0 27 40	0 28 11	0 28 44	0 29 18	0 29 55	0 30 33	−21	−25
1 15	0 31 36	0 32 05	0 32 36	0 33 09	0 33 44	0 34 21	0 34 59	0 35 40	0 36 23	0 37 08	0 37 56	−26	−32
1 30	0 37 36	0 38 11	0 38 48	0 39 27	0 40 09	0 40 52	0 41 38	0 42 26	0 43 17	0 44 11	0 45 08	−31	−38
1 45	0 43 26	0 44 07	0 44 50	0 45 35	0 46 22	0 47 12	0 48 05	0 49 01	0 49 59	0 51 02	0 52 07	−36	−43
2 00	0 49 04	0 49 50	0 50 39	0 51 29	0 52 23	0 53 19	0 54 19	0 55 22	0 56 28	0 57 38	0 58 52	−40	−49
2 15	0 54 29	0 55 20	0 56 14	0 57 10	0 58 10	0 59 12	1 00 18	1 01 28	1 02 41	1 03 59	1 05 21	−45	−54
2 30	0 59 40	1 00 35	1 01 34	1 02 36	1 03 41	1 04 49	1 06 01	1 07 17	1 08 38	1 10 03	1 11 32	−49	−59
2 45	1 04 34	1 05 34	1 06 38	1 07 44	1 08 54	1 10 08	1 11 26	1 12 48	1 14 15	1 15 47	1 17 24	−53	−64
3 00	1 09 12	1 10 16	1 11 24	1 12 35	1 13 50	1 15 09	1 16 32	1 18 00	1 19 33	1 21 11	1 22 54	−57	−68
3 15	1 13 30	1 14 38	1 15 50	1 17 06	1 18 25	1 19 49	1 21 17	1 22 50	1 24 29	1 26 13	1 28 02	−60	−72
3 30	1 17 29	1 18 41	1 19 57	1 21 16	1 22 39	1 24 08	1 25 40	1 27 18	1 29 02	1 30 51	1 32 46	−63	−76
3 45	1 21 08	1 22 23	1 23 42	1 25 04	1 26 32	1 28 04	1 29 41	2 31 23	1 33 11	1 35 05	1 37 06	−66	−80
4 00	1 24 25	1 25 43	1 27 05	1 28 31	1 30 01	1 31 37	1 33 17	1 35 03	1 36 55	1 38 54	1 40 59	−69	−83
4 15	1 27 20	1 28 40	1 30 04	1 31 33	1 33 07	1 34 45	1 36 29	1 38 18	1 40 14	1 42 16	1 44 25	−72	−86
4 30	1 29 52	1 31 14	1 32 41	1 34 12	1 35 48	1 37 29	1 39 15	1 41 08	1 43 06	1 45 11	1 47 24	−74	−88
4 45	1 32 00	1 33 24	1 34 53	1 36 25	1 38 04	1 39 47	1 41 35	1 43 30	1 45 31	1 47 39	1 49 54	−75	−90
5 00	1 33 44	1 35 10	1 36 40	1 38 14	1 39 54	1 41 38	1 43 29	1 45 25	1 47 28	1 49 38	1 51 55	−76	−91
5 15	1 35 04	1 36 30	1 38 02	1 39 37	1 41 18	1 43 04	1 44 55	1 46 53	1 48 57	1 51 08	1 53 27	−77	−92
5 30	1 35 59	1 37 26	1 38 58	1 40 34	1 42 16	1 44 02	1 45 54	1 47 53	1 49 58	1 52 10	1 54 30	−78	−93
5 45	1 36 30	1 37 57	1 39 29	1 41 05	1 42 47	1 44 34	1 46 26	1 48 25	1 50 30	1 52 43	1 55 03	−78	−94
6 00	1 36 35	1 38 02	1 39 34	1 41 10	1 42 51	1 44 38	1 46 31	1 48 29	1 50 34	1 52 46	1 55 06	−78	−93
6 15	1 36 15	1 37 43	1 39 14	1 40 49	1 42 30	1 44 16	1 46 08	1 48 05	1 50 10	1 52 21	1 54 40	−78	−93
6 30	1 35 32	1 36 58	1 38 28	1 40 03	1 41 42	1 43 27	1 45 18	1 47 14	1 49 17	1 51 27	1 53 44	−77	−92
6 45	1 34 24	1 35 48	1 37 17	1 38 50	1 40 28	1 42 12	1 44 01	1 45 56	1 47 56	1 50 04	1 52 20	−76	−91
7 00	1 32 52	1 34 15	1 35 42	1 37 13	1 38 49	1 40 31	1 42 18	1 44 10	1 46 09	1 48 14	1 50 27	−75	−89
7 15	1 30 56	1 32 17	1 33 42	1 35 11	1 36 45	1 38 24	1 40 09	1 41 59	1 43 51	1 45 57	1 48 06	−73	−87
7 30	1 28 36	1 29 56	1 31 19	1 32 46	1 34 17	1 35 53	1 37 35	1 39 21	1 41 14	1 43 13	1 45 19	−72	−85
7 45	1 25 57	1 27 13	1 28 33	1 29 56	1 31 25	1 32 58	1 34 36	1 36 19	1 38 08	1 40 03	1 42 05	−69	−82
8 00	1 22 54	1 24 07	1 25 24	1 26 45	1 28 10	1 29 40	1 31 14	1 32 53	1 34 38	1 36 29	1 38 26	−66	−79
8 15	1 19 31	1 20 41	1 21 55	1 23 12	1 24 33	1 25 59	1 27 29	1 29 04	1 30 44	1 32 30	1 34 22	−64	−76
8 30	1 15 48	1 16 55	1 18 05	1 19 18	1 20 35	1 21 57	1 23 23	1 24 53	1 26 28	1 28 09	1 29 55	−61	−72
8 45	1 11 47	1 12 49	1 13 55	1 15 05	1 16 18	1 17 35	1 18 56	1 20 21	1 21 51	1 23 26	1 25 07	−58	−68
9 00	1 07 27	1 08 26	1 09 28	1 10 33	1 11 41	1 12 54	1 14 10	1 15 30	1 16 54	1 18 23	1 19 57	−54	−64
9 15	1 02 51	1 03 45	1 04 43	1 05 43	1 06 47	1 07 54	1 09 05	1 10 19	1 11 38	1 13 01	1 14 28	−50	−59
9 30	0 57 59	0 58 49	0 59 42	1 00 38	1 01 37	1 02 38	1 03 44	1 04 52	1 06 04	1 07 21	1 08 41	−46	−55
9 45	0 52 53	0 53 39	0 54 27	0 55 18	0 56 11	0 57 07	0 58 07	0 59 09	1 00 15	1 01 24	1 02 38	−42	−50
10 00	0 47 34	0 48 15	0 48 58	0 49 44	0 50 32	0 51 22	0 52 16	0 53 12	0 54 11	0 55 13	0 56 19	−38	−45
10 15	0 42 03	0 42 39	0 43 18	0 43 58	0 44 40	0 45 25	0 46 12	0 47 01	0 47 53	0 48 49	0 49 47	−34	−40
10 30	0 36 22	0 36 53	0 37 26	0 38 01	0 38 38	0 39 16	0 39 57	0 40 40	0 41 25	0 42 12	0 43 02	−29	−34
10 45	0 30 32	0 30 58	0 31 26	0 31 55	0 32 26	0 32 58	0 33 32	0 34 08	0 34 46	0 35 26	0 36 08	−24	−29
11 00	0 24 35	0 24 56	0 25 18	0 25 42	0 26 06	0 26 32	0 27 00	0 27 28	0 27 59	0 28 31	0 29 05	−20	−23
11 15	0 18 31	0 18 47	0 19 04	0 19 22	0 19 40	0 20 00	0 20 20	0 20 42	0 21 05	0 21 29	0 21 55	−15	−18
11 30	0 12 23	0 12 34	0 12 45	0 12 57	0 13 09	0 13 23	0 13 36	0 13 51	0 14 06	0 14 22	0 14 39	−10	−12
11 45	0 06 12	0 06 18	0 06 23	0 06 29	0 06 36	0 06 42	0 06 49	0 06 56	0 07 04	0 07 12	0 07 21	− 5	− 6
Elongation: Azimuth	1 36 36	1 37 03	1 37 35	1 41 11	1 42 53	1 44 40	1 46 32	1 48 31	1 50 35	1 52 48	1 55 08	−78	−93
	h m s	h m s	h m s	h m s	h m s	h m s	h m s	h m s	h m s	h m s	h m s	s	s
Hour angle	5 53 52	5 55 43	5 55 34	5 55 24	5 55 14	5 55 04	5 54 53	5 54 42	5 54 31	5 54 20	5 54 07	+ 3	+ 5

Determination of the True Meridian and Local Mean Time by Means of Observations on the Sun.

The following method is the one usually employed to determine the true meridian in connection with the magnetic observations of the Coast and Geodetic Survey. It involves more computing than those already described, but is more convenient in that it is available for use during daylight when the magnetic observations are in progress. In connection with the time signals sent out by telegraph from observatories it furnishes the means also of determining approximately the longitude of the place of observation. It requires a theodolite with graduated vertical circle and a prismatic eyepiece for observing the Sun, and a well-regulated timepiece. The observations at a place usually consist of four independent sets of observations, two in the morning and two in the afternoon, each set consisting of four pointings on the Sun and two pointings on a reference mark symmetrically arranged as in the following example. For each pointing on the Sun the time is noted, and both horizontal and vertical circles are read. Observations are made from two to four hours from noon, and at nearly the same altitudes morning and afternoon. The reference mark should be a well-defined object nearly in the horizon and at least 100 yards distant.

The instrument (see Figure 28) used in the following observations has a glass diaphragm on which is ruled one horizontal and one vertical line. The symbols in the first column indicate the limbs of the Sun which were brought tangent to the lines of the diaphragm at the recorded time. The vertical circle is so graduated that it gives altitudes in one position and zenith distances in the other. The readings in the latter case have been subtracted from 90° when filling in the last column. The verniers allow readings on the horizontal and on the vertical circle to be made to minutes, half minutes being estimated.

A. M. observations of Sun for azimuth and time.

Station, Paducah, Ky. Date, Tuesday, July 2, 1901.
Theodolite of Mag'r No. 19. Observer, W. W.
Chronometer, Bond No. 475. Temperature, 32°. 2.

Sun's limb	V. C.	Chronometer time	Horizontal circle			Vertical circle		
			A	B	Mean	A	B	Mean
			° ′	′	° ′			
	R	Mark	352 39.5	37.5	352 38.5			
	L		172 37.0	36.0	36.5			
		h m s				° ′	′	° ′
⊙	L	9 35 15	291 41.0	39.5	111 40.2	44 17.0	18.0	44 17.50
⊙	L	36 10	291 49.5	48.5	111 49.0	44 29.0	29.0	44 29.00
⊙	R	37 40	112 47.0	44.0	112 45.5	44 48.0	49.5	45 11.25
⊙	R	38 47	112 57.0	56.0	112 56.5	44 35.0	36.5	45 24.25
Means		9 36 58.0			112 17.8			44 50.50
						Refr. and Par.		—0.78
⊙	R	9 39 46	113 07.0	05.5	113 06.2	44 23.0	25.0	45 36.00
⊙	R	40 49	113 16.0	18.0	113 17.0	44 10.5	12.0	45 48.75
⊙	L	42 20	292 50.0	48.0	112 49.0	45 41.5	42.0	45 41.75
⊙	L	43 24	292 60.0	58.5	112 59.2	45 54.0	55.0	45 54.50
Means		9 41 34.8			113 02.8			45 45.25
						Refr. and Par.		—.76
	L	Mark	172 38.0	37.5	352 37.8			
	R		352 40.0	38.0	39.0			
					352 37.9			

P. M. observations of Sun for azimuth and time.

Station, Paducah, Ky.
Theodolite of Mag'r No. 19.
Chronometer, Bond No. 175.

Date, Tuesday, July 2, 1901.
Observer, W. W.
Temperature, 36.°8.

Sun's limb	V. C.	Chronometer time	Horizontal circle A	Horizontal circle B	Horizontal circle Mean	Vertical circle A	Vertical circle B	Vertical circle Mean
			° ′	′	° ′			
	R	Mark	112 20.5	19.0	112 19.8			
	L		292 20.5	19.0	19.8			
		h m s				° ′	′	° ′
⊙	L	4 21 28	226 01.0	01.0	46 01.0	44 13.5	14.0	44 13.75
⊙	L	22 26	226 10.0	11.0	46 10.5	44 02.0	03.0	44 02.50
⊙	R	23 45	45 32.0	35.0	45 33.5	45 49.0	47.0	44 12.00
⊙	R	25 04	45 45.0	48.0	45 46.5	46 03.0	04.5	43 56.25
Means		4 23 10.8			45 52.9			44 06.12
						Refr. and Par.		−.79
⊙	R	4 34 24	47 17.0	14.5	47 15.8	47 53.0	56.0	42 05.50
⊙	R	35 36	47 25.0	27.0	47 26.0	48 07.5	10.0	41 51.25
⊙	L	37 12	228 28.0	26.0	48 27.0	41 07.0	08.0	41 07.50
⊙	L	38 19	228 38.0	37.5	48 37.8	40 53.0	53.5	40 53.25
Means		4 36 22.8			47 56.6			41 29.38
						Refr. and Par.		−.89
	L	Mark	292 21.0	19.5	112 20.2			
	R		112 21.0	19.5	20.2			
					112 20.0			

For computing these observations one requires a five-place table of logarithms of trigonometric functions and the American Ephemeris, or U. S. Hydrographic Office Publication No. 118, which gives the Sun's apparent declination and the equation of time. For correcting the observed altitude of the Sun for parallax and refraction, the following convenient table has been prepared, giving the combined correction for different altitudes and temperatures, to be subtracted from the observed altitude:

TABLE X.—*Correction to observed altitude of the Sun for refraction and parallax.*

App't Alt.	Temperature −10° C.	−5° C.	0° C.	+5° C.	+10° C.	+15° C.	+20° C.	+25° C.	+30° C.	+35° C.	App't Alt.
°	′	′	′	′	′	′	′	′	′	′	°
10	5.52	5.42	5.30	5.20	5.10	5.00	4.92	4.83	4.75	4.67	10
11	5.02	4.92	4.82	4.73	4.63	4.55	4.47	4.38	4.32	4.23	11
12	4.60	4.50	4.42	4.33	4.25	4.17	4.10	4.03	3.97	3.88	12
13	4.23	4.15	4.07	4.00	3.92	3.85	3.78	3.72	3.65	3.58	13
14	3.92	3.83	3.77	3.70	3.62	3.55	3.50	3.45	3.37	3.32	14
15	3.65	3.58	3.50	3.43	3.37	3.32	3.25	3.20	3.13	3.08	15
16	3.43	3.35	3.30	3.23	3.17	3.12	3.07	3.00	2.95	2.90	16
17	3.22	3.15	3.10	3.03	2.98	2.92	2.88	2.82	2.77	2.72	17
18	3.02	2.95	2.90	2.85	2.80	2.73	2.70	2.65	2.60	2.55	18
19	2.83	2.78	2.73	2.68	2.63	2.58	2.53	2.48	2.43	2.40	19

TABLE X.—*Correction to observed altitude of the Sun for refraction and parallax*—Concl'd.

App't Alt.	Temperature.										App't Alt.
	−10° C.	−5 °C.	0° C.	+5° C.	+10° C.	+15° C.	+20° C.	+25° C.	+30° C.	+35° C.	
°	′	′	′	′	′	′	′	′	′	′	°
20	2.68	2.63	2.58	2.53	2.48	2.43	2.38	2.33	2.30	2.27	20
21	2.53	2.48	2.43	2.38	2.35	2.30	2.27	2.22	2.17	2.13	21
22	2.38	2.35	2.30	2.25	2.22	2.18	2.13	2.08	2.05	2.02	22
23	2.28	2.25	2.20	2.15	2.12	2.08	2.03	1.98	1.95	1.93	23
24	2.17	2.13	2.08	2.05	2.02	1.98	1.93	1.88	1.87	1.83	24
25	2.07	2.03	1.98	1.95	1.92	1.88	1.83	1.80	1.77	1.75	25
26	1.99	1.95	1.90	1.87	1.83	1.80	1.75	1.72	1.70	1.67	26
27	1.88	1.85	1.82	1.78	1.75	1.72	1.68	1.63	1.62	1.60	27
28	1.80	1.77	1.72	1.70	1.67	1.63	1.60	1.57	1.53	1.52	28
29	1.72	1.68	1.65	1.63	1.60	1.57	1.53	1.50	1.47	1.46	29
30	1.65	1.62	1.58	1.57	1.53	1.50	1.47	1.45	1.42	1.40	30
32	1.53	1.50	1.47	1.45	1.42	1.38	1.35	1.33	1.30	1.28	32
34	1.41	1.37	1.35	1.32	1.30	1.27	1.23	1.23	1.20	1.18	34
36	1.30	1.27	1.25	1.22	1.20	1.18	1.15	1.13	1.10	1.08	36
38	1.20	1.18	1.15	1.13	1.12	1.10	1.07	1.05	1.02	1.02	38
40	1.11	1.10	1.07	1.05	1.03	1.02	0.98	0.97	0.95	0.93	40
42	1.03	1.00	0.98	0.97	0.95	0.93	0.90	0.88	0.87	0.87	42
44	0.96	0.93	0.92	0.90	0.88	0.87	0.85	0.83	0.82	0.80	44
46	0.89	0.88	0.87	0.85	0.83	0.82	0.80	0.78	0.77	0.75	46
48	0.83	0.82	0.80	0.78	0.77	0.75	0.73	0.72	0.70	0.68	48
50	0.77	0.75	0.73	0.72	0.70	0.68	0.67	0.67	0.65	0.63	50
55	0.63	0.62	0.60	0.60	0.58	0.57	0.57	0.55	0.53	0.52	55
60	0.52	0.52	0.50	0.50	0.48	0.47	0.47	0.45	0.45	0.43	60
65	0.42	0.40	0.40	0.40	0.38	0.38	0.37	0.37	0.35	0.33	65
70	0.32	0.32	0.32	0.30	0.30	0.30	0.28	0.28	0.28	0.27	70
75	0.23	0.23	0.23	0.22	0.22	0.22	0.20	0.20	0.20	0.18	75
80	0.15	0.15	0.13	0.13	0.13	0.13	0.13	0.12	0.12	0.12	80
85	0.07	0.07	0.07	0.07	0.07	0.07	0.07	0.05	0.05	0.05	85
90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	90

The formulæ used in computing the azimuth and local mean time from observations of the Sun made in the manner just described are the following:

$$\operatorname{ctn}^2 \tfrac{1}{2} A = \frac{\sin (s-\varphi) \sin (s-h)}{\cos s \cos (s-p)}$$

$$= \sec s \sec (s-p) \sin (s-h) \sin (s-\varphi)$$

$$\tan \tfrac{1}{2} t = \frac{\sin (s-h) \sec (s-p)}{\operatorname{ctn} \tfrac{1}{2} A}$$

A = azimuth of Sun, east of south in the morning, west of south in the afternoon.

φ = latitude of the place.

h = altitude of the Sun corrected for refraction and parallax in altitude.

p = Polar distance of the Sun, at the time of observation, taken from the American Ephemeris, or H. O. Publication No. 118.

$s = \tfrac{1}{2} (h + \varphi + p)$.

t = The hour angle of the Sun or apparent time of observation expressed in arc.

By combining the azimuth of the Sun with the angle between the Sun and mark, the azimuth of the mark may be obtained. This is counted from 0° to 360° from south

around by west. When the azimuth of the mark is known the true meridian may be laid off at any time by turning off the proper angle.

The apparent time of observation must be corrected for equation of time (taken from the Ephemeris), in order to obtain the local mean time. The following is a convenient form of computation:

Specimen computation of azimuth and longitude.

Date	Tuesday, July 2, 1901			
	° ′	° ′	° ′	° ′
h	44 49.7	45 44.5	44 05.3	41 28.5
ϕ	37 03.6	37 03.6	37 03.6	37 03.6
p	66 55.5	66 55.5	66 56.7	66 56.8
$2s$	148 48.8	149 43.6	148 05.6	145 28.9
s	74 24.4	74 51.8	74 02.8	72 44.4
$s-p$	7 28.9	7 56.3	7 06.1	5 47.6
$s-h$	29 34.7	29 07.3	29 57.5	31 15.9
$s-\varphi$	37 20.8	37 48.2	36 59.2	35 40.8
log sec s	0.57056	0.58316	0.56090	0.52767
" sec $(s-p)$	0.00371	0.00418	0.00334	0.00222
" sin $(s-h)$	9.69339	9.68723	9.69842	9.71516
" sin $(s-\varphi)$	9.78293	9.78743	9.77933	9.76586
" ctn^2 ½ A	0.05059	0.06200	0.04199	0.01091
" ctn ½ A	0.02530	0.03100	0.02100	0.00546
	° ′	° ′	° ′	° ′
A from South	86 39.8	85 54.8	87 13.8	89 16.8
Circle read.	112 17.8	113 02.8	45 52.9	47 56.6
S. Mer. "	198 57.6	198 57.6	318 39.1	318 39.8
Mark "	352 37.9	352 37.9	112 20.0	112 20.0
Az. of Mark	153 40.3	153 40.3	153 40.9	153 40.2
Mean	153 40.4			
log sec $(s-p)$ sin $(s-h)$	9.69710	9.69141	9.70176	9.71738
" tan ½ t	9.67180	9.66041	9.68076	9.71192
t in arc	50° 19′ 00″	49° 10′ 12″	51° 13′ 57″	54° 30′ 32″
	h m s	h m s	h m s	h m s
t	−3 21 16.0	−3 16 40.8	3 24 55.8	3 38 02.1
E	3 40.2	3 40.2	3 43.4	3 43.5
Local M. T.	8 42 24.2	8 46 59.4	3 28 39.2	3 41 45.6
Chron. time	9 36 58.0	9 41 34.8	4 23 10.8	4 36 22.8
Δt on L. M. T.	− 54 33.8	− 54 35.4	− 54 31.6	− 54 37.2
Δt on 75 M. T.	− 6.8	− 6.8	− 6.9	− 6.9
$\Delta\lambda$	54 27.0	54 28.6	54 24.7	54 30.3
Mean	54 27.6	=13° 36′.9	λ=	88° 36′.9

DETERMINATION OF THE MAGNETIC DECLINATION.

A.—With an Ordinary Compass or Surveyor's Transit.

When the surveyor determines the value of the magnetic declination himself it would be well for him to make the observations on several days, if possible, and probably the best time of the day would be toward evening, about 5 or 6 o'clock. At this time the declination reaches, approximately, its mean value for the day and is almost stationary. (See Tables III and IV.) Between 10 and 11 a. m. the declination also reaches its mean value, but it changes more rapidly than at 5 or 6 o'clock in the evening. The observations on any one day should extend at least over one-half of an hour, preferably an hour, and the readings should be taken every ten minutes. Before each reading of the needle it would be well to tap[a] the glass lightly with the finger or a pencil, so as to slightly disturb the needle from the position of rest it may have assumed. The accurate time should be noted opposite each reading and a note entered in the record book as to date, the weather, and the kind of time the observer's watch was keeping. A brief description of station and of method employed in determining the meridian line and declination should be added to the record.

Of course the instrument should be put in good adjustment and in first-class condition in every respect beforehand, and the readings should be made in such a manner as to eliminate any outstanding error of eccentricity, whether due to pivot of needle not being exactly over center of graduated circle, or to the needle being bent or the line of sight not passing through the zero points of the circle. In addition, it is very desirable that the surveyor should have some knowledge as to any constant error his instrument may be subject to, due to whatever cause, e. g., imperfect elimination of errors of adjustment or to the fact that the metal of the various parts may not be entirely free of traces of iron, or that the magnetic axis of the needle may not coincide with its geometric axis, etc. He can determine his constant error by making observations at one of the magnetic survey stations, or, better still, compare his instrument with a standard magnetometer or transit when opportunity affords. It would not be amiss to determine the compass correction before and after the determination of the magnetic declination.[b]

If these precautions are taken it is possible to determine the magnetic declination with a good transit with all needful accuracy. With special care results that will compare very favorably with those obtained by more elaborate instruments can be reached.

B.—With a Magnetometer.[c]

Special instruments, termed magnetometers, have been devised for determining accurately and expeditiously the magnetic declination and the intensity of the magnetic force. The essential feature of all is a cylindrical (or octagonal) bar magnet,

---

[a] Great care must be taken not to produce static electric charges by rubbing the glass plate in any manner. Remarkable deflections of the needle can thus be produced.

[b] Surveyor's compasses have been found to differ at times as much as ½° to 1° from the readings with the Coast and Geodetic Survey magnetometers.

[c] For a further description of methods and instruments, the reader is referred to the special paper giving directions for measurements in terrestrial magnetism, Appendix 8, Coast and Geodetic Survey Report for 1881; a new edition is now in preparation. The present purpose is simply to give a specimen of the general method employed without going into great detail.

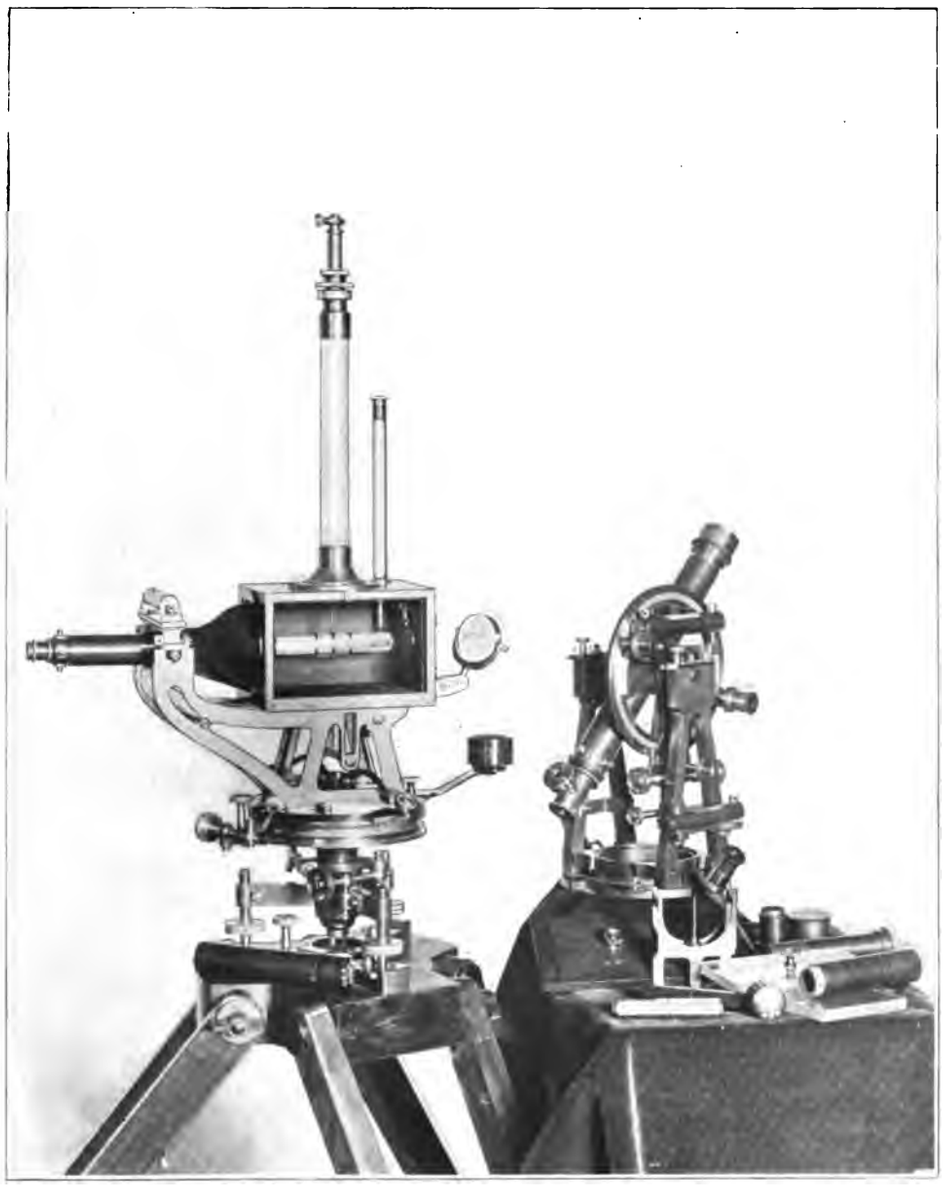


FIG. 28.—COAST AND GEODETIC SURVEY MAGNETOMETER.

suspended by two or three silk fibers and capable of being inverted in its stirrup, the magnet taking the place of the magnetic needle in the ordinary surveyor's compass.

The fiber suspension avoids the friction incident to the use of a pivot, and by making part of the observations with magnet erect and part with magnet inverted it is possible to eliminate the error arising from lack of coincidence of the magnetic and geometric axes.

The form of magnetometer which has been in general use by the Coast and Geodetic Survey is shown in Fig. 28. It is really a combination of magnetometer and theodolite. The latter, shown at the right of the figure, can be quickly mounted in place of the magnetometer and is used for determining the true meridian, as explained in the preceding pages, and the longitude and latitude. The magnetometer is shown in position for observing declination, except that one side of the magnet box has been removed to show the manner of suspending the magnet. The magnet used in this instrument is an octagonal hollow steel bar about 3 inches long and half an inch in diameter. The south end is closed by a plane glass on which has been etched a graduated scale divided into two minute spaces (0.1 of a division being estimated), while in the north end is a collimating lens so arranged that when the small reading telescope is focused on a distant object the graduated scale will be in focus also. The magnet is supported in a brass stirrup consisting of three rings joined to a shank about an inch long. In the upper end of this shank is an eye to which one end of the silk fibers is fastened. The other end of the fibers is fastened to a suitable arrangement at the top of the glass suspension tube, by means of which the magnet may be raised to the level of the observing telescope. Light to illuminate the scale of the magnet is admitted through a hole in the south end of the magnet house, with the aid of an adjustable mirror, if necessary. The north end of the magnet box is connected with the object end of the reading telescope by means of a hood of dark cloth, so that no glass comes between the objective and the magnet and air currents are excluded by the hood. The wooden sides of the magnet box may be removed to permit the necessary manipulation of the magnet. The long shank of the stirrup obviates the necessity of having a weight on the south end of the magnet to counterbalance the dip of the north end. When not in use the magnet is kept in a wooden case with its north end down, so that the effect of the Earth's magnetism may be rather to increase than decrease the strength of the magnet and thus assist in overcoming the gradual loss of the magnetic strength with time; the stirrup is fastened to a hook in the top of the magnet box to prevent the fibers from becoming twisted or broken.

The determination of the magnetic declination consists of two parts; first, the determination of the true meridian as described in the preceding pages, and second, the determination of the magnetic meridian. The method of performing the second operation with the above-described instrument is as follows: Mount the magnetometer, which is supposed to have been put in good adjustment, and level carefully by means of the striding level. Place the magnetometer so that sides of box will be parallel approximately to the magnetic meridian. Suspend the torsion weight (a solid brass cylinder of the same weight as the magnet) and replace, if need be, the wooden sides of the magnet box with others of glass. Watch the vibration of this weight and turn the torsion head at the top of the suspension tube until the torsion weight hangs parallel to the sides of the magnet box. The suspension fibers are then free from twist. Remove the torsion

weight, open the glass window at the south end of the magnet box, and point upon the object selected as a reference mark in the observations to determine the true meridian. Read the two verniers of the horizontal circle and enter readings in the record. Then close the window again, turn the instrument until the telescope points approximately south (magnetic), suspend the magnet with its scale erect, raise it to the level of the reading telescope, and put back the wooden sides of the magnet box. Next turn the instrument until the division of the scale nearest to the reading of the magnetic axis coincides approximately with the vertical line in the diaphragm of the reading telescope, clamp the horizontal circle, and read both verniers. Check the vibrations of the magnet by means of a bit of steel or iron until the magnet swings over 1–2 divisions of the scale, and take the extreme readings of the scale of the swinging magnet several times at minute intervals, recording also the time. The magnet is now turned upside down in the stirrup so that the scale appears inverted. It is here that the great convenience of an octagonal magnet becomes apparent, as it is possible at once to place the magnet in the stirrup in either the erect or inverted position, whereas with a round magnet in the older forms of instruments several trials are usually necessary.[a] Without changing the reading of the horizontal circle take several more readings of the scale of the magnet at minute intervals. Then return the magnet to the erect position and make several more scale readings. Read the horizontal circle to see that no change has taken place, remove the magnet, and conclude the set of observations by pointing on the reference mark. In general it will be found that the erect and inverted scale readings differ by several scale divisions owing to the noncoincidence of the magnetic and geometric axes of the magnet. The mean of the two gives the division of the scale corresponding to the magnetic axis, and we can then reduce the reading of the horizontal circle when pointing on the recorded scale division to what it would have been had we pointed parallel to the magnetic axis. Increasing scale readings, "magnet erect," correspond to decreasing circle readings.

The value in arc of one division of the scale is easily found by pointing on successive 5 or 10 division marks and noting the corresponding readings of the horizontal circle. In this particular instrument one division equals 2′.

The following example shows the form of record and computation. The azimuth of the mark and the reduction to local mean were obtained from the azimuth observations reproduced on pages 90 to 93. The diurnal variation or correction to reduce to mean of day was obtained from results of continuous observations at the magnetic observatory at Baldwin, Kans. In the absence of such results, an approximate correction would be obtained from a table similar to that given on page 47 (Table III), but in either case allowing for the fact that the diurnal variation increases as we go toward the magnetic pole.

[a] In some instruments of foreign make, recently imported by the Survey, arrangements are made whereby the round magnet can be inverted readily 180° from the outside without being obliged to open the magnetometer box and to take hold of the magnet.

Magnetic observations.

Station, Paducah, Ky.
Instrument, Mag'r No. 19.
Mark, Church spire.
Magnet, 19 L_n.

Declination.

Date, Tuesday, July 2, 1901.
Observer, W. W.

Line of detorsion, 310°.

Chron. time	Scale	Scale readings			Horizontal circle readings				
		Left	Right	Mean			Mark	Magnet	
h m		d	d	d			° ′	° ′	
7 54	E	38.1	38.8	38.45	Before	A	328 00.0	178	45.5
55	E	37.9	39.1	38.50		B	147 56.5	358	44.5
57	I	37.7	37.0	37.35	After	A	328 00.0	178	45.5
58	I	37.7	37.0	37.35		B	147 56.5	358	44.5
59	I	37.7	37.0	37.35	Mean		327 58.2	178	45.0
8 00	I	37.7	37.0	37.35					
02	E	38.1	38.6	38.35					
03	E	38.0	38.6	38.30					

Scale erect, mean		d	38.40
Scale inverted, mean			37.35
Axis			37.88

Mean scale reading erect		38.40
Axis		37.88
Scale—axis		+0.52
Reduction to axis		+1′.0
Circle reading	178	45.0
Mag'c S. M. reading	178	46.0
Mark reading	327	58.2
Azimuth of mark [a]	153	40.4
True S. M. reading	174	17.8
Magnetic declination E.	4	28.2
Diurnal variation		−2.9
Mean declination E.	4	25.3

Remarks:
Bright, clear day
Temp. 33°.5 Cent.
Torsion weight suspended 20 minutes

	h	m
Mean chron. time	7	58.5
Chron. fast on L. M. T.		54.5
Local mean time	7	04

[a] Counted from South around by West from 0° to 360°.

THE SECULAR CHANGE OF THE MAGNETIC DECLINATION IN THE UNITED STATES AND OUTLYING TERRITORIES.

GENERAL CHARACTERISTICS OF THE SECULAR CHANGE OF THE MAGNETIC DECLINATION IN THE UNITED STATES.

The greatest change in the magnetic declination, and therefore the one of most importance to the surveyor, is the so-called secular change, which requires several hundred years for its complete development and amounts in the compact part of the United States to 5–8°. This change appears to be of a periodic character, like the motion of a pendulum; that is, the compass needle, after moving continuously in one direction for a long term of years, gradually comes to a standstill and then begins a motion in the opposite direction. For example, at Portland, Me., the declination appears to have been about 12° west in 1700. From that time it decreased steadily until about 1780, when the needle reached its extreme easterly position, the declination being a little more than 8° west. Since 1780 the declination has been increasing steadily, and now amounts to about 14½° west. At San Francisco, on the other hand, the needle has moved continuously to the eastward since 1790, the declination changing from about 13° east in 1790 to nearly 17° east at the present time, when the extreme easterly position has been just about reached, apparently. Thus it is found that while the needle was swinging toward the west in Maine it was moving in the opposite direction in California. A study of observations at intervening stations shows that the extreme easterly position of the needle, which was reached in eastern Maine about 1765, occurred later and later going westward, about 1805 in the District of Columbia, for example, and about 1840 in Iowa, and in general passing across the country at the rate of one degree of longitude in two years, approximately. There is every reason to suppose that the extreme westerly position of the needle, which has been very nearly reached in Maine at the present time, will progress across the country in a similar manner, though possibly at a different rate.

Like the motion of the pendulum, the secular change of the direction of the compass needle is most rapid at the middle point of the swing and becomes slower and slower as the extremes are approached. Thus in the District of Columbia the annual change increased from zero in 1800 to about 4′ in 1870, and has since been decreasing, being about 3′ in 1900. Consequently a large error is introduced by assuming a constant rate of change for a long period of years.

For further information on the subject, the reader is referred to Appendix No. 1, Coast and Geodetic Survey Report for 1895, on the "Secular Variation of the Earth's Magnetic Force in the United States, etc." In that publication will be found collected the secular change data at more than 100 stations, an explanation of the methods used to derive suitable formulæ to represent the observed quantities, and the discussion of the observations according to those methods.

For information regarding the general laws and characteristics of the secular change for the entire globe, the reader should consult pages 38 to 46 of this publication.

SECULAR CHANGE TABLES.

Explanatory Remarks.

On the following pages are given for each State and Territory one or more tables, arranged alphabetically, showing the change in declination from the date of the earliest observations to the present time. The figures on any line refer to the 1st of January of the year given in the first column. Each table is based on an average value of declination for the area to which it refers. On the bottom line is given the annual change for 1902. For practically all of the United States the present effect of secular change of declination is to increase west declination and decrease east declination. For Sitka, Honolulu, and Manila, where the effect is the opposite of this, namely, east declination increasing, the fact is indicated by a minus sign before the value of annual change in the table.

In using these tables, the surveyor must bear in mind the uncertainties incident to the use of the compass and not be surprised if, for example, the change in declination for the last hundred years as given by the tables differs by half a degree or more from the value indicated by his own determinations. Even at the present time many compasses are in error by as much as a quarter of a degree, owing to imperfect construction or lack of proper care, and one hundred years ago the state of affairs was still worse, so that an error of half a degree was not unusual. These tables give approximately the actual change in the magnetic declination and do not take into account the error of any particular compass.

Whenever the surveyor is called upon to redetermine the boundary line of a tract of land run out at some previous period with a compass, and can find in the vicinity a well-defined line known to have been established with the same compass and at about the same time as the survey of the tract under consideration, he can not do better than determine the amount of change in the compass bearing of this well-defined line and use it to obtain the present bearings of the boundary lines to be reestablished. In this way he will take into account and eliminate the errors of the compasses used in the original and in the present survey. Only in the absence of such definite information is the use of the following tables recommended.

Table XI.—*Months and days expressed as a fraction of a year.*

Jan. 0..... 0.00	Apr. 1..... 0.25	July 2..... 0.50	Oct. 1..... 0.75
Jan. 18..... 0.05	Apr. 20..... 0.30	July 20..... 0.55	Oct. 19..... 0.80
Feb. 6..... 0.10	May 8..... 0.35	Aug. 7..... 0.60	Nov. 7..... 0.85
Feb. 24..... 0.15	May 26..... 0.40	Aug. 25..... 0.65	Nov. 25..... 0.90
Mar. 14..... 0.20	June 13..... 0.45	Sept. 13..... 0.70	Dec. 13..... 0.95

The use of these tables may best be explained by a few examples:

(1) What was the change in declination at Montgomery, Ala., between July 1, 1812, and September 30, 1892?

In the table for Alabama the values 6° 49′ east for 1810 and 6° 57′ east for 1820 are given, showing an average annual change of 0′.8 for the interval. Hence the value for 1812, July 1, would be $6° 49′ + (0′.8 \times 2.5) = 6° 51′$ east. Similarly for September 30, 1892, the value $4° 35′ - (3′.5 \times 2.75) = 4° 25′$ east is obtained. Hence the needle pointed 2° 26′ farther west in 1892 than in 1812.

(2) The magnetic declination at Allegheny, Pa., was 2° 56′ west in August, 1885. What was it in January, 1800?

From the table for western Pennsylvania the values 0° 29′ west for January 1, 1800, and 4° 04′ west for August, 1885, are derived. Hence the needle changed its direction 3° 35′ in the interval. The declination at Allegheny for the earlier date was therefore 2° 56′ west minus 3° 35′, or 0° 39′ east.

(3) A rectangular piece of land at Houston, Tex., was surveyed by compass in April, 1834, and the bearings recorded as follows: north 41° 45′ west, north 48° 30′ east, south 41° 30′ east, and south 48° 15′ west. What bearings should be used in order to retrace the lines in December, 1902?

From the table for eastern Texas the values 9° 39′ east for 1834, April, and 7° 50′ east for 1892, December, are derived, showing a change of 1° 49′ to the westward in the interval. The desired bearings are therefore north 39° 56′ west, north 50° 19′ east, south 39° 41′ east, and south 50° 04′ west.

(4) Prepare a table showing the secular change of declination at Sacramento, Cal., where the declination in October, 1897, was 16° 06′ east.

The value for that date derived from the table for middle California is 16° 27′ east; consequently all the tabular values must be diminished by 21′ in order to adapt the table to Sacramento.

Table giving Secular Change of the Magnetic Declination in the United States and Outlying Territories.

Year (Jan. 1)	Alabama	Alaska, Sitka	Alaska, Kodiak	Alaska, Unalaska	Alaska, St. Michael	Arizona, east	Arizona, west
	° ′	° ′	° ′	° ′	° ′	° ′	° ′
1650							
1660							
1670							
1680							
1690							
1700							
1710							
1720							
1730							
1740							
1750	4 02 E						
1760	4 38						
1770	5 13						
1780	5 44	25 05 E	23 59 E				
1790	6 12	25 45	24 50	18 53 E			
1800	6 34	26 25	25 34	19 16			
1810	6 49	27 02	26 11	19 35			
1820	6 57	27 38	26 38	19 48			
1830	6 56	28 13	26 55	19 54	30 14 E		
1840	6 48	28 54	27 01	19 53	29 05		
1850	6 32	29 08	26 54	19 46	27 55	13 47 E	14 00 E
1860	6 10	29 02	26 37	19 31	26 46	13 58	14 14
1870	5 42	28 59	26 08	19 11	25 36	14 01	14 21
1880	5 10	29 11	25 31	18 47	24 26	13 58	14 21
1890	4 35	29 30	24 46	18 19	23 17	13 47	14 14
1900	4 00	29 45	23 55	17 49	22 07	13 30	14 00
1910	3 26 E	29 50 E	23 00 E	17 13 E	20 58 E	13 08 E	13 40 E
Annual change in 1902	3′.4	−1′.0	5′.4	3′.3	7′.0	2′.1	1′.8

Table giving Secular Change of the Magnetic Declination in the United States and Outlying Territories—Continued.

Year (Jan. 1)	Arkansas	California, south	California, middle	California, north	Colorado, east	Colorado, west	Connecticut
	° ′	° ′	° ′	° ′	° ′	° ′	° ′
1650							
1660							
1670							
1680							
1690							
1700							8 44 W
1710							8 04
1720							7 22
1730							6 40
1740							6 00
1750							5 25
1760							4 56
1770							4 35
1780		10 28 E	12 17 E	14 09 E			4 23
1790		11 02	12 43	14 37			4 21
1800	8 11 E	11 36	13 12	15 06			4 29
1810	8 34	12 11	13 41	15 36			4 46
1820	8 49	12 43	14 10	16 06			5 12
1830	8 58	13 13	14 37	16 35			5 45
1840	8 57	13 40	15 02	17 03			6 23
1850	8 49	14 01	15 25	17 28	14 28 E	15 07 E	7 05
1860	8 32	14 17	15 43	17 49	14 31	15 15	7 47
1870	8 09	14 27	15 58	18 07	14 27	15 16	8 28
1880	7 40	14 30	16 09	18 20	14 15	15 07	9 05
1890	7 06	14 30	16 15	18 28	13 56	14 52	9 36
1900	6 30	14 30	16 30	18 30	13 30	14 30	10 00
1910	5 54 E	14 27 E	16 30 E	18 30 E	12 59 E	14 02 E	10 15 W
Annual change in 1902	3′.7	0.0	0.0	0.0	2′.9	2′.6	1′.8

Table giving Secular Change of the Magnetic Declination in the United States and Outlying Territories—Continued.

Year (Jan. 1)	Delaware	District of Columbia	Florida, east	Florida, west	Florida, south	Georgia	Hawaii Territory, Honolulu
	° ′	° ′	° ′	° ′	° ′	° ′	° ′
1650							
1660							
1670							
1680							
1690							
1700	6 00 W	5 11 W			2 00 E		
1710	5 31	4 45			2 29		
1720	4 55	4 12			3 02		
1730	4 15	3 33			3 38		
1740	3 34	2 53			4 13		
1750	2 54	2 13	3 13 E	4 03 E	4 46	3 13 E	
1760	2 17	1 34	3 50	4 40	5 16	3 50	
1770	1 47	1 00	4 26	5 16	5 41	4 26	
1780	1 23	0 33	4 58	5 47	6 01	4 58	
1790	1 08	0 13	5 23	6 14	6 12	5 23	
1800	1 04	0 04	5 41	6 35	6 16	5 41	10 52 E
1810	1 08	0 04	5 50	6 48	6 12	5 50	10 25
1820	1 23	0 13	5 50	6 53	6 01	5 50	10 02
1830	1 47	0 33	5 41	6 49	5 41	5 41	9 44
1840	2 17	1 00	5 23	6 37	5 16	5 23	9 31
1850	2 54	1 34	4 58	6 16	4 46	4 58	9 25
1860	3 34	2 13	4 26	5 50	4 13	4 26	9 25
1870	4 15	2 53	3 50	5 18	3 38	3 50	9 32
1880	4 55	3 33	3 13	4 43	3 02	3 13	9 45
1890	5 31	4 12	2 35	4 06	2 29	2 35	10 04
1900	6 00	4 45	2 00	3 30	2 00	2 00	10 28
1910	6 23 W	5 11 W	1 29 E	2 56 E	1 35 E	1 29 E	10 55 E
Annual change in 1902	2′.5	2′.8	3′.2	3′.5	2′.6	3′.2	−2′.6

Table giving Secular Change of the Magnetic Declination in the United States and Outlying Territories—Continued.

Year (Jan. 1)	Idaho, east	Idaho, west	Illinois	Indiana	Indian Territory	Iowa	Kansas, east
	° ′	° ′	° ′	° ′	° ′	° ′	° ′
1650							
1660							
1670							
1680							
1690							
1700							
1710							
1720							
1730							
1740							
1750							
1760							
1770							
1780							
1790							
1800			6 28 E	5 31 E			
1810			6 52	5 46			
1820			7 07	5 51		10 50 E	
1830			7 11	5 46		11 05	
1840			7 07	5 31		11 11	
1850	17 41 E	18 23 E	6 52	5 08	11 49 E	11 05	11 17 E
1860	18 00	18 45	6 28	4 37	11 40	10 50	11 11
1870	18 11	19 00	5 58	4 01	11 25	10 25	10 55
1880	18 16	19 08	5 21	3 20	11 02	9 52	10 33
1890	18 11	19 08	4 41	2 40	10 33	9 13	10 04
1900	18 00	19 00	4 00	2 00	10 00	8 30	9 30
1910	17 41 E	18 45 E	3 20 E	1 24 E	9 24 E	7 46 E	8 53 E
Annual change in 1902	1′.7	1′.3	4′.0	3′.7	3′.5	4′.4	3′.6

Table giving Secular Change of the Magnetic Declination in the United States and Outlying Territories—Continued.

Year (Jan. 1)	Kansas, west	Kentucky, east	Kentucky, west	Louisiana	Maine, north-east	Maine, south-west
	° ′	° ′	° ′	° ′	° ′	° ′
1650					18 30 W	
1660					17 59	
1670					17 21	
1680					16 37	
1690					15 47	
1700					14 57	
1710					14 08	
1720					13 23	
1730					12 43	
1740					12 11	
1750					11 50	10 34 W
1760					11 38	10 15
1770					11 38	10 10
1780					11 50	10 10
1790					12 11	10 15
1800		4 41 E	6 18 E	7 37 E	12 43	10 34
1810		4 50	6 36	7 58	13 23	11 02
1820		4 50	6 45	8 14	14 08	11 38
1830		4 41	6 45	8 22	14 57	12 18
1840		4 23	6 36	8 21	15 47	13 02
1850	12 26 E	3 58	6 18	8 13	16 37	13 47
1860	12 25	3 26	5 53	7 57	17 21	14 31
1870	12 14	2 50	5 21	7 35	17 59	15 10
1880	11 56	2 13	4 45	7 07	18 30	15 44
1890	11 31	1 35	4 08	6 34	18 50	16 11
1900	11 00	1 00	3 30	6 00	19 00	16 30
1910	10 25 E	0 29 E	2 55 E	5 25 E	18 58 W	16 38 W
Annual change in 1902	3′.4	3′.2	3′.6	3′.5	0′.1	1′.2

Table giving Secular Change of the Magnetic Declination in the United States and Outlying Territories—Continued.

Year (Jan. 1)	Maryland	Massachusetts, east	Massachusetts, west	Michigan, southeast	Michigan, southwest	Michigan, north
	° ′	° ′	° ′	° ′	° ′	° ′
1650	5 20 W					
1660	5 40					
1670	5 52					
1680	5 53					
1690	5 44					
1700	5 26	10 31 W	9 44 W			
1710	5 00	9 50	9 04			
1720	4 27	9 08	8 22			
1730	3 48	8 26	7 40			
1740	3 08	7 47	7 00			
1750	2 28	7 13	6 25			
1760	1 49	6 46	5 56			
1770	1 15	6 27	5 35			
1780	0 48	6 17	5 23			
1790	0 28	6 17	5 21			
1800	0 19	6 28	5 29	3 32 E		6 02 E
1810	0 19	6 47	5 46	3 44		6 29
1820	0 28	7 14	6 12	3 44	5 01 E	6 43
1830	0 48	7 49	6 45	3 32	5 01	6 43
1840	1 15	8 28	7 23	3 10	4 49	6 29
1850	1 49	9 10	8 05	2 39	4 27	6 03
1860	2 28	9 52	8 47	2 00	3 56	5 26
1870	3 08	10 32	9 28	1 16	3 17	4 40
1880	3 48	11 08	10 05	0 30 E	2 33	3 48
1890	4 27	11 38	10 36	0 17 W	1 47	2 53
1900	5 00	12 00	11 00	1 00	1 00	2 00
1910	5 26 W	12 13 W	11 15 W	1 38 W	0 17 E	1 11 E
Annual change in 1902	2′.8	1′.6	1′.8	4′.0	4′.4	5′.1

Table giving Secular Change of the Magnetic Declination in the United States and Outlying Territories—Continued.

Year (Jan. 1)	Minnesota, north	Minnesota, south	Mississippi	Missouri	Montana, east	Montana, west
	° ′	° ′	° ′	° ′	° ′	° ′
1650						
1660						
1670						
1680						
1690						
1700						
1710						
1720						
1730						
1740						
1750						
1760						
1770						
1780						
1790						
1800			7 34 E			
1810			7 53			
1820	11 34 E	11 25 E	8 04	9 30 E		
1830	11 51	11 41	8 08	9 40		
1840	11 57	11 47	8 04	9 40	18 25 E	19 34 E
1850	11 51	11 41	7 53	9 31	18 43	19 59
1860	11 34	11 25	7 34	9 13	18 52	20 17
1870	11 06	10 59	7 08	8 47	18 52	20 26
1880	10 29	10 25	6 38	8 16	18 43	20 26
1890	9 47	9 44	6 05	7 39	18 25	20 17
1900	9 00	9 00	5 30	7 00	18 00	20 00
1910	8 11 E	8 15 E	4 55 E	6 21 E	17 28 E	19 35 E
Annual change in 1902	4′.9	4′.6	3′.5	4′.0	3′.0	2′.3

Table giving Secular Change of the Magnetic Declination in the United States and Outlying Territories—Continued.

Year (Jan. 1)	Nebraska, east	Nebraska, west	Nevada, east	Nevada, west	New Hampshire	New Jersey
	° ′	° ′	° ′	° ′	° ′	° ′
1650						8 18 W
1660						8 35
1670						8 42
1680						8 38
1690						8 24
1700					12 58 W	8 00
1710					12 18	7 28
1720					11 34	6 49
1730					10 49	6 07
1740					10 05	5 23
1750					9 25	4 40
1760					8 51	4 01
1770					8 26	3 28
1780					8 10	3 03
1790					8 05	2 47
1800					8 12	2 42
1810					8 29	2 47
1820	12 32 E				8 55	3 03
1830	12 50				9 30	3 28
1840	13 00				10 11	4 01
1850	13 00	14 26 E	15 44 E	16 14 E	10 55	4 40
1860	12 52	14 26	16 00	16 35	11 40	5 23
1870	12 34	14 17	16 10	16 50	12 24	6 07
1880	12 08	13 59	16 13	17 00	13 04	6 49
1890	11 37	13 32	16 10	17 03	13 36	7 28
1900	11 00	13 00	16 00	17 00	14 00	8 00
1910	10 20 E	12 23 E	15 44 E	16 50 E	14 14 W	8 24 W
Annual change in 1902	3′.9	3′.6	1′.4	0′.8	1′.8	2′.6

Table giving Secular Change of the Magnetic Declination in the United States and Outlying Territories—Continued.

Year (Jan. 1)	New Mexico, east	New Mexico, west	New York, east	New York, west	North Carolina, east	North Carolina, west
	° ′	° ′	° ′	° ′	° ′	° ′
1650						
1660						
1670						
1680						
1690			10 26 W			
1700			10 00			
1710			9 26			
1720			8 45			
1730			7 59			
1740			7 13			
1750			6 28	4 05 W	0 09 W	1 20 E
1760			5 46	3 22	0 27 E	1 57
1770			5 10	2 43	0 59	2 31
1780			4 43	2 11	1 26	3 01
1790			4 27	1 49	1 44	3 23
1800			4 21	1 38	1 53	3 37
1810			4 27	1 38	1 53	3 41
1820			4 43	1 49	1 44	3 37
1830			5 10	2 11	1 25	3 22
1840			5 46	2 43	0 59	2 59
1850	12 53 E	13 35 E	6 28	3 22	0 26 E	2 29
1860	12 57	13 42	7 13	4 05	0 10 W	1 55
1870	12 53	13 43	7 59	4 52	0 49	1 17
1880	12 42	13 35	8 45	5 38	1 26	0 38
1890	12 24	13 21	9 26	6 22	2 01	0 02 E
1900	12 00	13 00	10 00	7 00	2 30	0 30 W
1910	11 32 E	12 34 E	10 26 W	7 29 W	2 53 W	0 56 W
Annual change in 1902	2′.7	2′.4	2′.8	3′.3	2′.5	2′.8

Table giving Secular Change of the Magnetic Declination in the United States and Outlying Territories—Continued.

Year (Jan. 1)	North Dakota, east	North Dakota, west	Ohio	Oklahoma	Oregon, east	Oregon, west
	° ′	° ′	° ′	° ′	° ′	° ′
1650						
1660						
1670						
1680						
1690						
1700						
1710						
1720						
1730						
1740						
1750						
1760						
1770						
1780						
1790						
1800			3 29 E			15 56 E
1810			3 38			16 34
1820			3 38			17 13
1830			3 29			17 52
1840	15 10 E		3 09			18 29
1850	15 10	17 31 E	2 42	10 04 E	18 06 E	19 03
1860	15 00	17 31	2 08	9 59	18 31	19 32
1870	14 41	17 21	1 29	9 47	18 49	19 57
1880	14 13	17 02	0 49	9 28	19 00	20 15
1890	13 39	16 34	0 08 E	9 01	19 04	20 26
1900	13 00	16 00	0 30 W	8 30	19 00	20 30
1910	12 17 E	15 21 E	1 03 W	7 55 E	18 49 E	20 30 E
Annual change in 1902	4′.2	3′.7	3′.5	3′.4	0′.9	0′.0

Table giving Secular Change of the Magnetic Declination in the United States and Outlying Territories—Continued.

Year (Jan. 1)	Pennsylvania, east	Pennsylvania, west	Philippines, Manila	Porto Rico	Rhode Island	South Carolina
	° ′	° ′	° ′	° ′	° ′	° ′
1650						
1660						
1670						
1680	7 36 W					
1690	7 35					
1700	7 23				11 01 W	
1710	6 58				10 20	
1720	6 23				9 38	
1730	5 41				8 56	
1740	4 54				8 17	
1750	4 05		0 13 E		7 43	1 48 E
1760	3 19		0 09		7 16	2 25
1770	2 37		0 07		6 57	2 59
1780	2 02	1 08 W	0 05		6 47	3 28
1790	1 39	0 44	0 04		6 47	3 50
1800	1 26	0 29	0 05	3 33 E	6 58	4 03
1810	1 27	0 23	0 06	3 10	7 17	4 08
1820	1 40	0 29	0 08	2 42	7 44	4 03
1830	2 05	0 44	0 12	2 12	8 19	3 50
1840	2 39	1 08	0 16	1 40	8 58	3 28
1850	3 22	1 40	0 21	1 08	9 40	2 59
1860	4 08	2 18	0 27	0 36	10 22	2 25
1870	4 57	2 59	0 34	0 07 E	11 02	1 48
1880	5 44	3 41	0 41	0 20 W	11 38	1 10
1890	6 26	4 23	0 49	0 43	12 08	0 33 E
1900	7 00	5 00	0 55	1 00	12 30	0 00
1910	7 23 W	5 31 W	1 00 E	1 13 W	12 43 W	0 28 W
Annual change in 1902	2′.7	3′.3	—0′.5	1′.5	1′.6	2′.9

Table giving Secular Change of the Magnetic Declination in the United States and Outlying Territories—Continued.

Year (Jan. 1)	South Dakota, east	South Dakota, west	Tennessee, east	Tennessee, west	Texas, east	Texas, middle
	° ′	° ′	° ′	° ′	° ′	° ′
1650						
1660						
1670						
1680						
1690						
1700						
1710						
1720						
1730						
1740						
1750						
1760						
1770						
1780						
1790						
1800			4 41 E			
1810			4 50			
1820			4 50	7 06 E	9 20 E	
1830			4 41	7 06	9 35	10 41 E
1840	13 35 E		4 23	6 58	9 44	10 52
1850	13 35	14 28 E	3 58	6 41	9 44	10 57
1860	13 26	14 28	3 26	6 17	9 37	10 52
1870	13 08	14 18	2 50	5 47	9 21	10 41
1880	12 41	14 00	2 13	5 13	8 59	10 23
1890	12 08	13 33	1 35	4 37	8 32	9 59
1900	11 30	13 00	1 00	4 00	8 00	9 30
1910	10 49 E	12 22 E	0 29 E	3 25 E	7 25 E	8 57 E
Annnal change in 1902	4′.1	3′.7	3′.2	3′.6	3′.4	3′.2

Table giving Secular Change of the Magnetic Declination in the United States and Outlying Territories—Continued.

Year (Jan. 1)	Texas, west	Texas, northwest	Utah	Vermont	Virginia, east	Virginia, west
	° ′	° ′	° ′	° ′	° ′	° ′
1650						
1660						
1670						
1680						
1690						
1700				11 58 W	4 25 W	
1710				11 18	4 00	
1720				10 34	3 29	
1730				9 49	2 54	
1740				9 05	2 16	
1750				8 25	1 39	
1760				7 51	1 03	0 25 E
1770				7 26	0 31	0 59
1780				7 10	0 06 W	1 28
1790				7 05	0 12 E	1 50
1800				7 12	0 21	2 03
1810				7 29	0 21	2 08
1820				7 55	0 12 E	2 03
1830	11 47 E			8 30	0 06 W	1 50
1840	12 01			9 11	0 31	1 28
1850	12 09	12 07 E	16 17 E	9 55	1 03	0 59
1860	12 08	12 09	16 28	10 40	1 39	0 25 E
1870	12 01	12 02	16 32	11 24	2 16	0 12 W
1880	11 47	11 49	16 28	12 04	2 54	0 50
1890	11 26	11 28	16 17	12 36	3 29	1 27
1900	11 00	11 00	16 00	13 00	4 00	2 00
1910	10 29 E	10 28 E	15 36 E	13 14 W	4 25 W	2 28 W
Annual change in 1902	2′.9	3′.1	2′.2	1′.7	2′.7	3′.0

Table giving Secular Change of the Magnetic Declination in the United States and Outlying Territories—Concluded.

Year (Jan. 1)	Washington, east	Washington, west	West Virginia	Wisconsin	Wyoming, east	Wyoming, West
	° ′	° ′	° ′	° ′	° ′	° ′
1650						
1660						
1670						
1680						
1690						
1700						
1710						
1720						
1730						
1740						
1750						
1760						
1770						
1780		17 15 E				
1790		17 48	2 07 E			
1800		18 23	2 22			
1810		19 00	2 27			
1820		19 37	2 22	8 40 E		
1830		20 12	2 07	8 46		
1840		20 45	1 44	8 40		
1850	21 44 E	21 15	1 13	8 22	15 40 E	17 20 E
1860	22 05	21 41	0 37 E	7 55	15 48	17 33
1870	22 20	22 02	0 03 W	7 18	15 48	17 37
1880	22 30	22 17	0 44	6 35	15 40	17 33
1890	22 33	22 27	1 24	5 49	15 23	17 20
1900	22 30	22 30	2 00	5 00	15 00	17 00
1910	22 20 E	22 30 E	2 29 W	4 13 E	14 30 E	16 33 E
Annual change in 1902	0′.8	0.0	3′.2	4′.7	2′.8	2′.5

THE MAGNETIC DECLINATION IN THE UNITED STATES AND OUTLYING TERRITORIES FOR JANUARY 1, 1902.

INTRODUCTION.

Since the last publication by the Survey of a paper by Schott showing for the date January 1, 1900, the distribution of the magnetic declination within the area of the United States, nearly six years have elapsed, during which time, especially since July 1, 1899, a large amount of additional material has been obtained. A new discussion of the material on hand exhibiting the results for an epoch nearer to the present time was therefore undertaken.

The improvements in the present paper treating of the geographical distribution of the declination for January, 1902, consist of:

(1) The introduction of observations made by the Coast and Geodetic Survey since the publication of 1896 and additions to the collection of data from other sources.

(2) The extension and increase of the knowledge of the secular change and especially the systematizing of the secular change tables, thus giving increased precision to the "reduction to epoch;" that is, to the sign and amount of correction to be applied to the observed value to reduce it to January 1, 1902.

EXPLANATORY REMARKS TO DECLINATION TABLES.

The primary arrangement of the tables is alphabetically by States. For each State, Territory, or other geographical subdivision the collected declinations are next divided into two groups, the first containing results obtained by the Coast and Geodetic Survey observers, the second the results from other sources. Where the same station has been occupied several times only the latest result is given, except when that result is in the second group; in this case the latest result by the Coast and Geodetic Survey is given also. The results in each group are arranged in order of latitude, beginning at the south, this arrangement having been found the most serviceable for the various purposes of the tables. The collection of all values at any one place is reserved for the publication dealing exclusively with the determination of the secular change of the magnetic elements.

The seven columns contain in order the name of the station or place where observations were made, the latitude, the longitude, the date of observation, expressed in year and decimal fraction, the observed declination, the same reduced to January 1, 1902, and the name of the observer or authority. The latitudes and longitudes are taken from the best available authorities. Those in Group I are usually the result of observation and are in general correct within one minute of latitude and two minutes of longitude.

Those in Group II are given as furnished by the observers or are scaled from the topographic sheets of the United States Geological Survey, the Post Route maps, or the Rand and McNally State maps.

The results which have been added to Group II since the publication of Appendix 1, Coast and Geodetic Survey Report for 1896, are principally from two sources, the publication of the United States Geological Survey "Magnetic Declination in the United States," by Henry Gannett, 1896, and the replies of county surveyors to a circular letter sent out by the Superintendent of the Coast and Geodetic Survey in February, 1901. Gannett collected the values of declination recorded in connection with the surveys of the General Land Office and grouped them by counties. Where a result for a county is given as the mean of a certain number of stations, it is taken from his collection. Gannett also collected considerable data from county surveyors.

For additional information regarding any of the results in the tables, application may be made to the Superintendent of the Coast and Geodetic Survey, who will be glad to have his attention called to any errors.

CHART OF THE LINES OF EQUAL MAGNETIC DECLINATION AND OF EQUAL ANNUAL CHANGE IN THE UNITED STATES FOR 1902.

Before explaining the present chart a brief summary of the work of the Survey in the past regarding the publication of isogonic charts is given so as to facilitate future reference.

PREVIOUS ISOGONIC CHARTS BY THE COAST AND GEODETIC SURVEY.

The first table of declination results accompanied by an isogonic chart[a] was published by A. D. Bache, Superintendent United States Coast Survey, and J. E. Hilgard, Assistant, in the Annual Report for 1855, Appendix No. 47, and plate No. 56. The declinations were reduced to a common epoch—1850—by means of assumed values of the annual change, and for convenience of discussion the declinations were arranged in geographical groups which could be separately treated by application of Lloyd's interpolation formula. The table comprises 153 stations, and the isogonic curves, computed for each degree of declination, cover but a narrow strip along the coast line. In the following year the same authors produced a new chart, as the result of a more extended discussion, inclusive of all recent observations, but retained the epoch 1850. (See Annual Report of 1856, Appendix No. 28.) On plate No. 61 of the Report, the isogonic curves fairly cover the area of the eastern part of the United States, as well as the area bordering on the Pacific coast, and a connection is shown over the Gulf of Mexico and along the Mexican boundary.

The Annual Report for 1861, Appendices No. 23 and No. 24, contains two small isogonic charts (plate No. 30) designed for a special purpose and in aid of navigation along the southern coast; epoch 1860.

The Annual Report for 1862, Appendix No. 19, gives an account of a magnetic survey of the State of Pennsylvania, and on plate No. 47 isomagnetic lines are laid down for the two epochs 1842 and 1862.

The next isogonic chart, constructed by Assistant C. A. Schott, accompanies Appendix No. 19 of the Annual Report for 1865, plate No. 27. It is on a larger scale, but covers about the same area as the chart of 1856. It embodies, however, the results accumulated, and uses the latest information respecting the secular change. The epoch is 1870.

The next chart issued (Annual Report for 1876, Appendix No. 21, plate No. 24) is due to Assistant J. E. Hilgard. It is referred to the epoch 1875, and includes the results of the Survey up to 1877, and

[a] The first detailed chart extending some distance into the interior of the country was constructed by Prof. E. Loomis for the epoch 1840, and published in Silliman's Journal Science and Arts, Vol. XL.

in part to 1879, as well as about 200 observations made from 1871 to 1876, under the auspices of the National Academy of Sciences and at the expense of the Bache fund. In this chart the isogonic curves cover the whole of the United States, excepting Alaska, and distinct notice is taken of certain large irregularities in the distribution of magnetism which made themselves manifest in certain regions in the eastern and central parts of the country. The curves over the western part remain smooth and regular, the observations there not yet being sufficiently numerous for the safe delineation of irregularities.

"Distribution of the Magnetic Declination for 1885." This publication brought out in the Annual Report for 1885, Appendix No. 13, by Assistant C. A. Schott, is designated by him as the "first edition," on account of its completeness, a special chart for Alaska and adjacent regions being included. The arrangement of the table of results is alphabetic by States, with two subdivisions in each, one for Coast and Geodetic Survey results, the other containing the results from all remaining available sources, as compiled by the author; the table contains in all 2 359 stations. The results were reduced to the epoch 1885, with the aid of Schott's extensive secular variation discussions. The curves for the United States were determined by the graphical process, and were published on a chart of scale $\frac{1}{1\,700\,000}$, while those for Alaska and adjacent waters, on account of the scarcity of data, were made to depend upon an interpolation formula established by the application of the method of least squares; these last curves were published on a chart, to the scale of $\frac{1}{13\,700\,000}$. As far as the accumulated material would permit, special notice was taken of all locally disturbed regions, and the extent and the amount of the local deflections were shown on the chart.

"Distribution of the Magnetic Declination for 1890." This is Schott's "second edition," and is contained in the Annual Report for 1889, Appendix 11. The table of declination comprises 3 237 stations; in all cases where a station has been repeatedly occupied, only that observation nearest to the epoch 1890 is given. The curves for the United States are again obtained by the graphical method, and those for Alaska by a newly established interpolation formula.

"Distribution of the Magnetic Declination for 1900." (Third edition; Appendix 1, Annual Report for 1896.) The charts for the epoch 1900 are based on 3 591 tabulated declinations. They are a great improvement upon the former charts, the reductions to the epoch 1900 being based on a new and very exhaustive discussion of the secular variation of the magnetic declination at 118 stations, embracing 1 435 annual observations.

The steady improvement in the isogonic charts is made readily apparent by a comparison of the earlier ones with those of recent date. In the latter the curves are no longer beautifully curved lines, but exhibit many sinuosities, showing that the magnetic distribution, as it actually occurs in nature, is being more and more truly represented. For Alaska, on account of the paucity of the data, the distribution, as shown by the charts, must still be more or less conventional.

Isogonic Chart of the United States for 1902.

(Plate I.)

The secular change tables employed for reducing the tabulated declination results to January 1, 1902, with the necessary explanations, will be found in the previous chapter.

The following tabular summary exhibits the number of declination entries given in the "Magnetic Declination Tables" appended, upon which the present isogonic chart was based. The first column gives the State or Territory in alphabetical order, the next headed I, tabulates the number of declination values recently observed by the Coast and Geodetic Survey as contained in Group I of the tables; the third column, IIa, gives the number of declination entries collected from outside sources by the Coast and Geodetic Survey and contained in Group II; the fourth column, IIb, gives the number of declination entries in Group II, extracted from Gannett's publication, being based almost entirely upon the United States Land Office data, and the final column, IIc, shows the number of individual stations upon which Gannett's entries or mean values of IIb were based. Nearly one-half of the number of values given in column I have been observed by the Coast and Geodetic Survey since July 1, 1899.

Number of entries of magnetic declination results for each State and Territory.

	I C. & G.S.	IIa Other	IIb G. values	IIc G. stations		I C. & G.S.	IIa Other	IIb G. values	IIc G. stations
Alabama	19	9	47	332	New Hampshire	8	13	1	1
Alaska	137	41			New Jersey	20	150	0	0
Arizona	2	49	34	742	New Mexico	32	67	58	1 794
Arkansas	16	35	78	693	New York	48	217	8	8
California	103	48	61	303	North Carolina	116	3	3	3
Colorado	31	53	70	392	North Dakota	6	22	48	1 193
Connecticut	23	13	1	1	Ohio	19	90	45	266
Delaware	11	1	0	0	Oklahoma	5	4	33	507
District of Columbia	2	29	0	0	Oregon	39	38	29	87
Florida	43	15	38	170	Pennsylvania	53	89	12	12
					Philippine Islands	15	33		
Georgia	32	45	20	20	Porto Rico	17			
Hawaiian Territory	20				Rhode Island	8	2	0	0
Idaho	3	72	44	363	South Carolina	20	13	2	2
Illinois	13	49	63	523	South Dakota	9	15	80	1 357
Indiana	18	15	98	793	Tennessee	18	38	22	24
					Texas	110	30	50	50
Indian Territory	3	5	7	165	Utah	26	57	39	326
Iowa	42	47	63	609	Vermont	4	15	2	2
Kansas	34	26	162	1 274	Virginia	114	32	14	14
Kentucky	30	13	20	25	Washington	45	89	32	297
Louisiana	26	27	48	668	West Virginia	57	30	5	5
					Wisconsin	11	68	52	431
Maine	42	38	4	4	Wyoming	15	76	46	816
Maryland	140	10	0	0	West Indies, etc.	22	55		
Massachusetts	36	26	3	3	Mexico, West	33	71		
Michigan	10	264	86	1 248	British America, East of 75°	13	129		
Minnesota	30	40	100	1 021	British America, 75°–90°	18	162		
Mississippi	18	22	74	1 007	British America, West of 90°	17	93		
Missouri	14	158	27	27					
Montana	15	68	42	197					
Nebraska	43	86	102	1 122					
Nevada	47	77	42	711		1 921	3 082	1 915	19 608

The chart for 1902 was based principally on the data enumerated in columns I and IIa, principal weight being given, in general, to Group I, except when the data in Group II were obtained with instruments and methods comparable with those of the Coast and Geodetic Survey. In the regions where the data from I and IIa were sparsely distributed, recourse was had to the data, IIb. It was found, however, that although the 1915 mean values of IIb were based on nearly 20000 observations, their inaccuracy was of such a nature and the uncertainty of precise geographical position to which they applied was of such an extent at times that practically little use could be made of them for the determination of the actual distribution. A local disturbance amounting to a half degree, and even a degree, could not with certainty be made out with their aid. These data some decades ago would have had value, but now with so many observations the accuracy of which can be precisely gauged, their value is of a subordinate character.

It should also be pointed out that the 1921 values in Group I in many instances have been repeatedly verified by previous observations at the same station by the Coast and Geodetic Survey, only the most recent values, as above stated, being given, however. In this way actual local disturbances have been repeatedly determined.

The following statement might be made: the present isogonic chart for the United States is based on results plotted at about 5000 points, embodying all the declination data of known value up to date. To give the actual number of single observations utilized, without further information, conveys to the reader an entirely erroneous impression, as he instinctively concludes that that number of values was actually plotted, thus confusing number of observations with number of points or stations plotted. The value of an average declination result based on many single observations, depends entirely upon the character of the observations combined and the purpose of the combination, so that it may easily happen that an average result, no matter on how many observations of indifferent or uncertain value it may depend, is no better—often not as good—as a single result, the accuracy of which is precisely known. When a result departs from the normal or uniform distribution, one should have the facts to enable him to tell whether the departure is an actual fact of nature, or error of observation, or due to the particular combinatory process.

By thus carefully distinguishing between the relative value of the results in Groups I and II, the attempt was made to draw the lines of equal magnetic declination to conform as nearly as possible with the *facts of nature*. No curvature in the lines nor isolated oval, such as occurs, for example, in Iowa, Texas, etc., has been shown unless borne out by a critical examination of the material. Quite likely the next edition of the Chart with the aid of new material will exhibit still more irregularities in the lines, and in certain localities it will be found that no system of lines can give a representation of the actual distribution of the Earth's magnetism in these regions. It has been the general experience thus far that the greater the number of *points* at which observations have been obtained the more irregularities do the isogonic lines present. To eliminate the facts of nature by numerical combinatory processes or by a system of smooth mathematical curves based on empirical formulæ serves no practical purpose.

As stated, the present purpose is to draw isogonic lines representing the observed facts as well as possible. An attempt to draw the system of lines which would exist if the United States were uniformly or regularly magnetized and no local or regional disturbances of the needle existed may be made at some future time. By comparing these mathematical lines, representing the normal or undisturbed distribution of magnetism, with the actually observed facts, it may be possible to localize the centers of magnetic disturbances and to ascertain their origin. This is the only method by which deductions of permanent value can be made.

No additional explanations of the Chart, to be found at the end of the book, other than that given in the legend will be required. It was published separately in February, 1902, in order to satisfy immediate demands, and is now given along with the publication which furnishes the accompanying text.

The chief new features are:

(1) The return to the base map used for the isogonic charts of 1875, 1885, and 1890, revised up to date and having sufficient physical features and towns to render it

possible to readily identify any desired localitv, to interpret irregularities in the isogonic lines, and to estimate their value in the region crossed by them.

(2) The lines of equal annual change of the magnetic declination for the present period, with the aid of which the isogonic lines can readily be referred to any year within five years prior or subsequent to 1902.

By examining the isogonic chart it will be seen that the magnetic declination in the United States varies at present from 21° east, in the extreme northern part of Maine, to 23° west, in the extreme northern part of the State of Washington, hence 44° from one end of the country to the other. Over the greater portion of the United States the needle points east of north.

The only former attempt to draw the lines of equal annual change was made by Schott in Appendix 19, Coast and Geodetic Survey Report for 1865. By systematizing the secular change tables it was possible to renew the attempt. The present lines were constructed in a manner similar to that used for the lines of equal magnetic declination. While the lines are to some extent conventional, it has been found that they represent the observed annual changes generally within 1′, hence they will suffice for all practical purposes. With their aid it is possible to tell at once the way and rate according to which the magnetic declination is at present changing in the United States.

Secular Motion of the Agonic Line in the United States.

Fig. 29 gives the positions of the agonic line, or line of no magnetic declination, along which the needle points to the north, from 1700 to 1900. It will be seen that in 1800 the agonic line had reached its most northerly position, passing through western Pennsylvania, central Maryland, and skirting the coast of Virginia. The agonic line of 1902 passes through Ohio, a little west of Columbus, and nearly through Columbia, S. C.

ISOGONIC CHART OF ALASKA FOR 1902.

(Plate II.)

In the case of Alaska, owing to the paucity of the observations and the great extent of territory involved, the graphical method followed in drawing the isogonic lines for the United States could not be safely employed. Schott accordingly made use of a mathematical interpolation formula for the purpose of drawing the isogonic lines for this region, for details regarding which see Appendix 4, Coast and Geodetic Survey Report for 1894, and Appendix 1, Report for 1896, pages 148 and 149.

Upon examining Schott's chart with the aid of the material obtained since the date of its construction, it was found that the isogonic lines required a slight shifting to the left to apply for 1900. To refer the lines to January 1, 1902, requires a shifting of about the same amount to the right on account of secular change. Accordingly the chart of 1900, uncorrected, applies as closely to 1902 as the material now at hand would enable one to safely judge. The present chart should therefore be regarded as merely a preliminary one. By the time of the next issue sufficient new data will have been obtained to render it worth while to attempt the construction of an entirely new chart, which is not the case at present.

Local Disturbances of the Compass in Alaska.

Attention must be called to the large and frequent disturbances of the compass which mariners in Alaskan waters encounter. The Survey is making a special study of these, and will publish a separate monograph on the subject. In the meanwhile reference

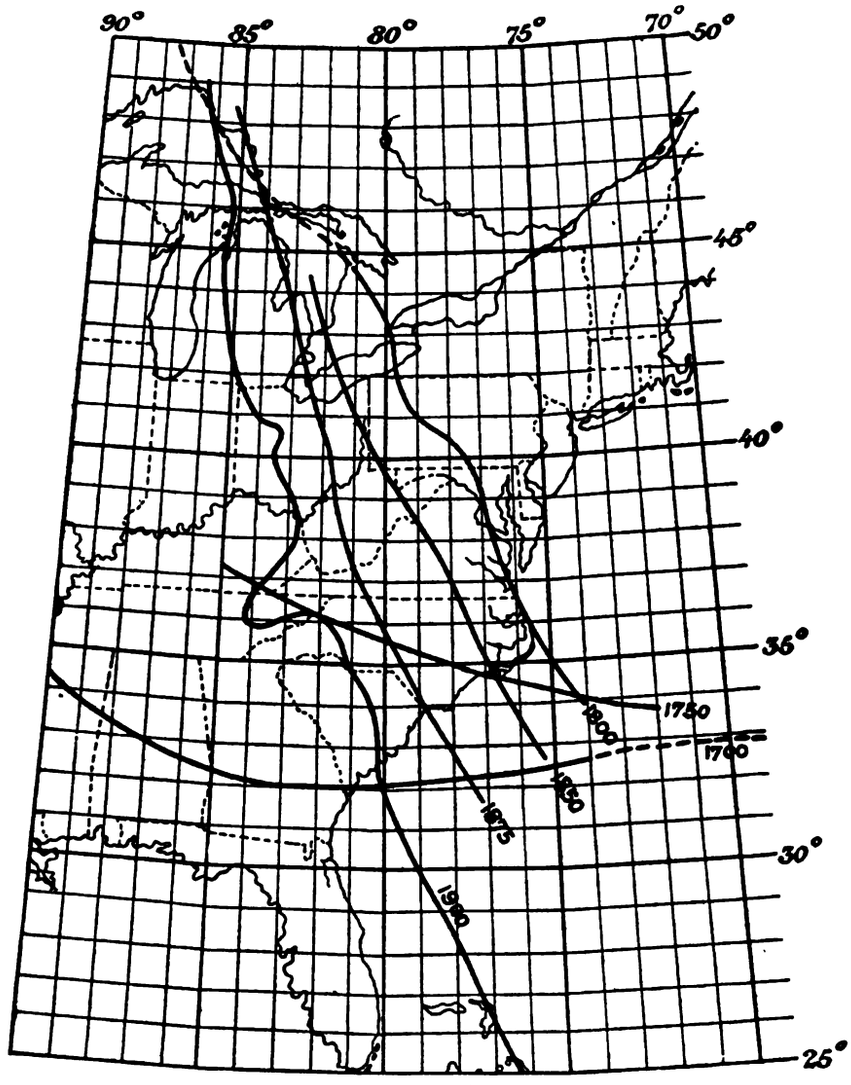


FIG. 29.—Map showing the position of the agonic line between 1700 and 1900 (Schott).

is made to United States Coast Pilot, Pacific Coast, Alaska, Part I, published by the Survey in 1901.

ISOGONIC CHARTS OF THE OTHER OUTLYING TERRITORIES.

Isogonic charts for the other outlying territories of the United States have been at present deferred, awaiting the accumulation of material. The declination values at hand will be found in the tables, in their proper places.

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902.

[Group I, results from United States Coast and Geodetic Survey; Group II, results from all other sources.]

ALABAMA

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group I	° ′	° ′		*East* ° ′	*East* ° ′	
Fort Morgan	30 14	88 01	1847.40	7 04.1	4 20	Fauntleroy&Ruth
Mobile	30 42	88 03	1896.26	4 31.2	4 10	J. B. Baylor
Citronelle	31 05	88 14	1896.18	4 41.5	4 21	Do.
Evergreen	31 26	86 57	1900.40	3 46.7	3 41	D. L. Hazard
Greenville	31 50	86 36	1896.20	3 46.6	3 26	J. B. Baylor
Lower Peachtree	31 50	87 37	1857.33	6 02.4	3 38	G. W. Dean
Eufaula	31 54	85 08	1896.24	2 55.5	2 35	J. B. Baylor
Mount Carmel	32 01	86 21	1892.41	3 39	3 05	F. W. Perkins
Ethridge	32 05	87 04	1892.40	3 34	3 00	Do.
Union Springs	32 09	85 42	1900.41	2 55.9	2 50	D. L. Hazard
Montgomery	32 22	86 18	1900.41	2 46.1	2 40	Do.
Selma	32 24	87 05	1896.22	3 09.5	2 49	J. B. Baylor
Opelika	32 37	85 25	1896.25	3 02.0	2 42	Do.
Birmingham	33 31	86 49	1900.42	2 44.9	2 39	D. L. Hazard
Indian Mountain	34 02	85 26	1875.65	4 10.6	2 40	F. P. Webber
Cullman	34 10	86 50	1900.43	3 16.7	3 11	D. L. Hazard
Decatur	34 37	86 59	1900.43	4 11.5	4 06	Do.
Huntsville	34 42	86 35	1900.44	4 00.7	3 55	Do.
Florence	34 48	87 43	1890.41	4 15.6	3 34	J. B. Baylor
Group II						
Baldwin County	.. ..	.. ..	1841	6 35	3 42	Mean, 8 stations
Mobile County	.. ..	.. ..	1846	7 00	4 15	Mean, 6 stations
Mount Vernon	31 06	88 01	1870.8	6 27	4 41	W. W. Carson
Escambia County	.. ..	.. ..	1839	5 40	2 44	Mean, 8 stations
Elba	31 26	86 05	1900.0	3 45	3 38	D. McKinnon
Conecuh County	.. ..	.. ..	1839	5 45	2 50	Mean, 10 stations
St. Stephens	31 32	88 04	1901	4 30	4 27	B. D. Turner
Monroe County	.. ..	.. ..	1839	5 36	2 40	Mean, 7 stations
Troy	31 49	85 58	1895	4 06	3 43	I. M. Adams
Barbour County	.. ..	.. ..	1832	6 30	3 28	Mean, 8 stations
Wilcox County	.. ..	.. ..	1846	6 36	3 50	Mean, 9 stations
Bullock County	.. ..	.. ..	1832	6 30	3 28	Mean, 6 stations
Shiloh	32 08	87 42	1895	4 15	3 52	County surveyor
Lowndes County	.. ..	.. ..	1846	6 30	3 44	Mean, 4 stations
Montgomery County	.. ..	.. ..	1843	6 30	3 40	Mean, 20 stations
Russell County	.. ..	.. ..	1832	6 30	3 28	Mean, 24 stations
Marengo County	.. ..	.. ..	1842	6 30	3 39	Mean, 2 stations
Cahaba	32 18	87 10	1860.3	6 10	3 53	W. Scott
Dallas County	.. ..	.. ..	1844	6 47	4 00	Mean, 18 stations
Selma	32 24	87 05	1895	4 00	3 37	County surveyor
Macon County	.. ..	.. ..	1832	6 30	3 28	Mean, 8 stations
Tuskegee	32 26	85 45	1888.5	3 55	3 07	W. C. Torrance
Coatopa	32 30	88 06	1873	5 50	4 12	J. F. Williamson
Autauga County	.. ..	.. ..	1842	6 30	3 39	Mean, 8 stations
Sumter County	.. ..	.. ..	1832	7 50	4 48	Do.
Elmore County	.. ..	.. ..	1838	6 30	3 34	Do.
Lee County	.. ..	.. ..	1832	6 30	3 28	Mean, 16 stations
Marion	32 36	87 18	1895	4 15	3 52	D. E. Bates
Perry County	.. ..	.. ..	1845	6 50	4 03	Mean, 2 stations
Greensboro	32 42	87 36	1895	4 40	4 17	County surveyor
Hale County	.. ..	.. ..	1842	6 30	3 39	Mean, 8 stations

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

ALABAMA—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued.	° ′	° ′		*East* ° ′	*East* ° ′	
Greene County	.. ..	.. ..	1838	7 06	4 10	Mean, 5 stations
Tallapoosa County	.. ..	.. ..	1832	6 30	3 28	Mean, 20 stations
Chilton County	.. ..	.. ..	1842	6 30	3 39	Mean, 3 stations
Coosa County	.. ..	.. ..	1832	6 30	3 28	Mean, 17 stations
Chambers County	.. ..	.. ..	1833	6 22	3 21	Mean, 18 stations
Goodwater	33 04	86 04	1895	2 30	2 07	D. B. Brown
Blocton	33 06	87 07	1895	3 30	3 07	County surveyor
Talladega	33 09	86 30	1900	3 45	3 40	B. E. Ogletree
Tuscaloosa	33 12	87 33	1895	5 00	4 37	County surveyor
Pickens County	.. ..	.. ..	1832	8 00	4 58	1 station
Clay County	.. ..	.. ..	1832	5 25	2 23	Mean, 18 stations
Randolph County	.. ..	.. ..	1834	5 28	2 28	Mean, 23 stations
West	33 15	85 25	1895	2 30	2 07	County surveyor
Talladega County	.. ..	.. ..	1832	5 26	2 24	Mean, 6 stations
Birmingham	33 32	86 48	1901	3 11	3 08	P. S. Milner
Jacksonville	33 49	85 46	1901	2 25	2 22	W. T. Morton
Blount County	.. ..	.. ..	1839	5 40	2 44	Mean, 3 stations
Etowah County	.. ..	.. ..	1839	5 40	2 44	1 station
Cullman County	.. ..	.. ..	1839	5 40	2 44	Do.
Marshall County	.. ..	.. ..	1839	5 40	2 44	Mean, 10 stations
Dekalb County	.. ..	.. ..	1839	5 40	2 44	Mean, 3 stations
Morgan County	.. ..	.. ..	1853	5 17	2 45	Do.
Moulton	34 29	87 17	1895	2 30	2 07	County surveyor
Madison	34 41	86 48	1875.4	5 11.6	3 40	F. E. Hilgard
Tuscumbia	34 44	87 43	1896	4 43	4 23	County surveyor

ALASKA

Group I	° ′	° ′		*East* ° ′	*East* ° ′	
Amchitka Island, Constantine Harbor	51 24	E179 12	1873.58	7 17.1	.. ..	W. H. Dall
Adak I., Bay of Islands	51 49	176 32	1873.61	13 52.1	.. ..	Do.
Kiska Island, Kiska Harbor	51 59	E177 30	1873.55	11 06.4	.. ..	Do.
Atka Island, Nazan Bay	52 11	174 15	1873.65	16 57.3	.. ..	Do.
Attu Island, Chichagof Hbr.	52 56	E173 12	1873.48	7 43.0	.. ..	Do.
Unalaska I., Cove Point	53 24	167 30	1880.75	16 15.3	15 13	Dall & Baker
Round	53 46	166 23	1901.52	20 51	20 50	F. H. Brundage
Strait	53 48	166 18	1901.52	17 32	17 31	Do.
Biorka	53 50	166 13	1901.53	18 48	18 47	Do.
Egg	53 52	166 03	1901.53	18 22	18 21	Do.
Food	53 52	166 19	1901.51	16 09	16 08	Do.
Shelf	53 53	166 14	1901.51	17 38	17 37	Do.
Unalaska I., Dutch Harbor	53 54	166 32	1900.80	18 14.0	18 10	J. F. Pratt
Eider	53 58	166 35	1901.50	16 23	16 22	F. H. Brundage
Aektok (Rootok) Pass	54 03	165 31	1901.65	16 28	16 27	C. C. Yates
Basalt	54 07	165 23	1901.60	17 32	17 31	F. H. Brundage
Tigalda	54 08	165 08	1901.59	22 56	22 55	Do.
Tigalda Bay	54 08	165 00	1901.59	17 03	17 02	Do.
Ugamak	54 13	164 47	1901.62	18 45	18 44	C. C. Yates
Peterson	54 24	162 38	1901.68	18 19	18 18	R. L. Faris
Acherk	54 29	162 49	1901.62	18 18	18 17	C. Lyman

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

ALASKA—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group I—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Otter Cove	54 46	163 20	1901. 58	19 30	19 29	C. Lyman
Portland Canal, south end Pearse Island	54 46	130 24	1888. 59	29 37. 3	30 12	A. N. Wood
Howkan	54 50	132 50	1881. 67	27 03. 4	27 54	H. E. Nichols
Amagat Island	54 54	162 53	1901. 49	18 25	18 23	O. M. Leland
Little Koniuji Island	55 03	159 23	1880. 54	21 25. 2	20 10	Dall & Baker
Dolgoi Island, south end	55 03	161 43	1880. 56	17 59	16 44	Do.
Tamgas Harbor	55 04	131 28	1883. 59	28 34. 7	29 21	H. E. Nichols
Belkofski	55 05	162 00	1880. 56	21 25. 7	20 11	Dall & Baker
Mary Island	55 06	131 14	1895. 54	28 21. 7	28 38	O. B. French
Portland Canal, Astr'l Pt.	55 13	130 04	1888. 66	27 44. 3	28 18	A. N. Wood
Humboldt Hbr., Popof I.	55 19	160 31	1880. 55	20 17. 0	19 02	Dall & Baker
Peninsula Point	55 23	131 44	1885. 61	28 07. 2	28 48	R. A. Marr
Kasaan Bay, Long Island	55 30	132 19	1880. 35	27 48	28 31	Dall & Baker
Union Bay	55 45	132 12	1885. 60	30 29. 8	31 03	R. A. Marr
Chirikof Island	55 48	155 43	1874. 45	23 00. 9	.. ..	W. H. Dall
Kupreanof Harbor	55 48	159 25	1901. 42	20 39	20 37	O. M. Leland
Chiachi Islands	55 52	159 05	1874. 48	21 55. 9	.. ..	W. H. Dall
Port Moller	55 55	160 35	1874. 61	21 22. 2	.. ..	Do.
Portland Canal, head of	55 56	130 00	1888. 52	30 08. 6	30 36	A. N. Wood
Dewey Anchorage	55 56	132 22	1886. 69	28 30	29 01	C. C. Marsh
Burroughs Bay	56 02	131 06	1893. 39	30 23. 9	30 41	H. M. W. Edmonds
Port McArthur	56 04	134 06	1886. 57	27 50	28 21	C. C. Marsh
Semidi Islands	56 05	156 39	1874. 45	22 56. 9	.. ..	W. H. Dall
Shakan	56 09	133 28	1886. 54	33 00	33 31	C. C. Marsh
Shakan Island	56 09	133 36	1886. 58	29 25	29 56	Do.
Shakan Entrance	56 09	133 32	1881. 62	30 03. 2	30 44	H. E. Nichols
Chignik Bay	56 19	158 24	1874. 46	22 01. 7	.. ..	W. H. Dall
Red Bay, Sumner Strait	56 20	133 15	1886. 43	29 40	30 11	C. C. Marsh
Wrangell, North Base	56 27	132 23	1886. 5	29 20	29 51	Do.
Wrangell	56 28	132 23	1893. 48	29 38. 3	29 55	G. R. Putnam
Duncan Canal	56 36	133 06	1887. 57	30 05. 7	30 34	C. C. Marsh
St. George Island	56 36	169 32	1897. 67	19 02. 7	18 48	G. R. Putnam
Frederick Sound	56 55	132 51	1887. 44	29 38. 0	30 07	C. C. Marsh
Portage Bay, Frederick Sd.	57 00	133 20	1887. 49	30 29. 3	30 58	Do.
Sitka	57 03	135 20	1902. 00	29	.. ..	H. M. W. Edmonds
St. Paul Island	57 07	170 17	1897. 52	16 42. 0	16 26	G. R. Putnam
Woewodski Harbor	57 10	134 15	1889. 49	29 35	30 00	A. N. Wood
Cape Fanshaw	57 11	133 34	1887. 54	30 05. 1	30 34	C. C. Marsh
Cleveland Passage	57 12	133 30	1889. 33	30 13	30 38	A. N. Wood
Poke, Gambier Island	57 27	133 50	1889. 53	30 16	30 35	Do.
Killisnoo	57 28	134 34	1900. 76	28 14. 2	28 16	L. A. Bauer
Clot, Sanford Cove	57 41	133 28	1889. 72	28 12	28 30	A. N. Wood
Kodiak Island, St. Paul	57 47	152 24	1896. 45	24 33. 8	24 17	H. P. Ritter
Icy Strait, First	58 05	135 07	1901. 49	30 35	30 35	Burger&Westdahl
Icy Strait, Peach	58 10	135 03	1901. 45	30 28	30 28	L. H. Westdahl
Port Althorp	58 12	136 24	1880. 46	32 15. 5	32 37	Dall & Baker
Auke Point	58 12	134 33	1890. 51	30 44	30 55	H. C. Poundstone
Hat, Taku River	58 12	134 09	1893. 47	31 02	31 10	J. E. McGrath
Cross Sound, Spence	58 12	136 38	1901. 57	30 09	30 09	L. H. Westdahl
Cross Sound, Jog	58 13	136 02	1901. 53	29 04	29 04	L. H. Westdahl
Cross Sound, Lack	58 13	136 08	1901. 53	31 19	31 19	Do.
Funter Bay	58 14	134 55	1890. 68	30 15	30 26	H. C. Poundstone
Juneau	58 18	134 24	1900. 77	33 23. 4	33 25	Bauer & Weinrich
Dundas Bay	58 22	136 22	1900. 76	31 14. 1	31 15	L. A. Bauer

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

ALASKA—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group I—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Icy Strait, Gus	58 23	135 55	1901.50	30 19	30 19	L. H. Westdahl
Point Lena, Lynn Canal	58 24	134 46	1890.42	30 24	30 36	H. C. Poundstone
Taku River, Astronom. Sta.	58 26	133 59	1893.56	30 16.3	30 25	O. B. French
Taku River, Island	58 30	133 54	1893.42	30 49	30 58	S. B. Tinsley
Taku River, Duck	58 31	133 52	1893.43	30 52	31 01	Do.
Taku River, Terrace	58 31	133 46	1893.44	30 57	31 06	Do.
Taku River, Islet	58 32	133 44	1893.44	30 12	30 21	Do.
Taku River, Fishery	58 32	133 41	1893.47	32 06	32 15	Do.
Taku River, Wood	58 34	133 40	1893.47	32 25	32 34	Do.
Taku River, Lean	58 34	133 40	1893.47	31 28	31 37	Do.
Taku River, Nob	58 35	133 40	1893.48	31 58	32 07	Do.
Taku River, Shoal	58 35	133 38	1893.52	32 34	32 42	Do.
Taku River, Fast	58 36	133 35	1893.51	31 38	31 46	Do.
Lituya Bay	58 37	137 40	1874.37	30 02.8	.. ..	W. H. Dall
La Perouse, Lituya Bay	58 38	137 41	1894.62	30 10.1	30 10	J. E. McGrath
Hagemeister Island	58 48	160 40	1874.60	22 52.8	.. ..	W. H. Dall
Camp Muir, Glacier Bay	58 50	136 05	1890.69	30 26	30 26	H. F. Reid
Anchorage Pt., Chilkat Inlet	59 10	135 28	1894.53	30 29.0	30 29	J. F. Hayford
Chilkat	59 12	135 27	1890.55	30 39	30 39	H. C. Poundstone
Chilkoot	59 12	135 21	1890.59	19 39	19 39	Do.
Dalton, Chilkat River	59 20	135 48	1894.52	31 56.9	31 57	A. L. Baldwin
Open, Chilkat River	59 21	135 48	1894.52	31 54.5	31 54	Do.
Sight, Chilkat River	59 23	135 53	1894.50	29 54.9	29 55	Do.
Koh-klux, Chilkat River	59 24	135 53	1894.49	24 08.3	24 08	Do.
Dangerous Cape	59 24	151 53	1880.51	24 32.5	23 50	Dall & Baker
Upper, Chilkat River	59 24	135 54	1900.47	32 23.7	32 24	O. B. French
Porcupine Creek	59 25	136 16	1900.50	31 25.3	31 25	Do.
Limber, Taiya River	59 32	135 20	1894.60	32 09.0	32 09	J. F. Pratt
Ocean Cape, Yakutat Bay	59 33	139 52	1892.66	30 24	30 15	J. E. McGrath
Yakutat Bay, Port Mulgrave	59 34	139 47	1892.67	29 55.8	29 47	J. H. Turner
Coal Point, Ogolnoi	59 36	151 24	1880.50	25 48.5	25 05	Dall & Baker
Malaspina, Southwest Base	59 44	140 12	1894.5	30 43	30 35	J. E. McGrath
Malaspina, Northeast Base	59 45	140 06	1892.58	30 42	30 33	Do.
Mount Hoorts, Yakutat Bay	59 45	139 32	1892.63	30 51	30 42	Do.
Yahtse, East Base	59 49	141 08	1894.6	30 29.6	30 22	Do.
Kokinhenic Island	60 18	145 03	1898.47	29 25.9	29 19	H. P. Ritter
Port Etches	60 21	146 38	1874.41	29 09.8	.. ..	W. H. Dall
Nunivak Island, Cape Etolin	60 25	166 08	1874.58	21 33.8	.. ..	Do.
Mag	60 28	146 26	1900.58	28 40.0	28 37	H. M. W. Edmonds
Reef	60 34	145 59	1900.56	28 57.7	28 55	Do.
Orca	60 35	145 41	1900.55	29 27.2	29 24	Do.
Kun	61 51	165 34	1899.55	19 44.8	19 27	G. R. Putnam
Bright	62 11	163 58	1899.69	20 37.9	20 21	Do.
Black (Kripniyuk)	62 20	165 19	1898.68	19 42.5	19 19	Do.
Kwiklokchun	62 34	164 51	1898.62	19 48.8	19 24	Do.
Head of Apoon	62 54	164 01	1899.59	20 35.8	20 19	Do.
Okweah	63 02	164 37	1899.62	20 38	20 21	R. L. Faris
Quit, near Kotlik	63 02	163 33	1899.70	21 15	20 59	Do.
Pastoliak	63 03	163 13	1898.64	21 01	20 38	G. R. Putnam
St. Michael	63 29	162 01	1898.55	22 17.3	21 53	Do.
Do.	63 29	162 01	1900.50	22 54.0	22 44	E. R. Frisby
Camp Davidson, Yukon R.	64 41	140 55	1891.4	35 43.0	35 11	J. E. McGrath
Current	65 07	165 19	1900.71	20 53.3	20 44	J. F. Pratt
Port Clarence	65 17	166 46	1900.74	19 55.4	19 47	Do.
Shamansville	66 00	149 06	1891.51	33 11	32 18	J. E. McGrath

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

ALASKA—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group I—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Chamisso Hbr., Kotzebue Sd.	66 13	161 49	1880. 66	26 49	25 00	Dall & Baker
Fort Yukon, Yukon River	66 34	145 18	1891. 48	35 05. 0	34 17	J. E. McGrath
Camp Colonna, Porcupine R.	67 25	140 59	1890. 46	38 06. 8	36 58	H. M. W. Edmonds
Valley of Three Rivers	68 37	141 00	1890. 3	40 33	39 00	J. H. Turner
Near Cape Lisburne	68 53	166 06	1880. 64	25 42. 8	22 41	Dall & Baker
Near Icy Cape	70 13	162 15	1880. 65	30 05. 7	26 43	Do.
Uglaamie, near Pt. Barrow	71 18	156 40	1883. 16	35 37. 2	31 51	P. H. Ray
Group II						
Peak of Iron Island	51 58	E178 23	1849. 5	14 00	.. ..	M. D. Tebenkof
Chichagof Harbor, Attu I.	52 56	E173 13	1894. 5	10	9 38	A. F. Fechteler
Straits between Unalaska and Sedaghur	53 46	166 12	1789. 5	19 30	.. ..	J. H. Cox
Croyalgu Island	54 17	164 47	1826. 5	20 50	.. ..	F. W. Beechey
Belkofski Bay, Bailey Hbr.	55 09	162 07	1879. 5	21 08	.. ..	G. W. Bailey
Amak Island	55 27	163 08	1827. 5	21 15	.. ..	F. P. Lütke
Portage Bay	55 35	160 38	1893. 7	20 20	19 51	Z. L. Tanner
Red Fish Bay	56 23	134 55	1847	28 15	.. ..	Russian chart
North Cape	56 40	135 10	1847	28 50	.. ..	Do.
Red Fish Bay	56 42	135 00	1847	27 45	.. ..	Do.
Sitka Sound	56 56	135 35	1809	27 30	.. ..	Do.
Wrangell Harbor	56 59	156 33	1827. 5	24 00	.. ..	F. P. Lütke
Kodiak, near Cape Chiniak (Greville)	57 20	152 51	1839. 5	26 44	.. ..	E. Belcher
Salisbury Sound	57 20	135 45	1833	30 00	.. ..	Russian chart
Cape Suworof	58 42	157 00	1827. 5	26 15	.. ..	F. P. Lütke
Cape Black	58 43	162 05	1827. 5	25 10	.. ..	Do.
Clark Point	58 49	158 32	1890. 6	23 40	23 00	U. S. S. Albatross
Kachemak Bay, Cook Inlet	59 30	151 45	1892. 3	25	24 27	Z. L. Tanner
Do.	59 46	151 09	1895. 8	24 35	24 13	F. N. Curtiss
Disenchantment Bay (Puerto del Desengaño)	59 51	139 50	1791. 5	32 24	.. ..	D. A. Malaspina
Do.	60 00	139 50	1791. 5	32 49	.. ..	Do.
Kulitnak River	61 41	157 01	1844. 4	26	.. ..	Lieut. Zagoskine
Norton Sound	63 28	161 42	1827. 5	30 30	.. ..	F. P. Lütke
St. Lawrence Island	63 43	171 23	1879. 6	19 05	.. ..	A. Wykander
Yukon River	64 56	158 19	1843. 5	31 46	.. ..	Lieut. Zagoskine
Cape Good Hope	66 03	164 30	1826. 5	29 28	.. ..	F. W. Beechey
Cape Deceit	66 06	162 36	1826. 5	30 18	.. ..	Do.
Cape Krusenstern	67 11	163 37	1826. 5	30 12	.. ..	Do.
Point Hope, near end of Spit	68 19	166 46	1889. 7	23 10	21 32	C. H. Stockton
Point Demarcation	69 41	141 00	1837. 5	48 23	.. ..	Th. Simpson
Point Anxiety	70 10	147 30	1837. 6	45 00	.. ..	Do.
Foggy Island	70 16	147 38	1825. 5	43 15	.. ..	J. Franklin
Icy Cape, near Indian V.	70 20	161 52	1889. 7	28 51	26 54	C. H. Stockton
Cross Island	70 28	147 52	1889. 6	38 40	36 11	Do.
On Ice, NW. of Anxiety Pt.	70 31	148 34	1850. 5	44 37	.. ..	R. J. Le M. Maclure
Wainwright Inlet	70 35	160 36	1880. 6	38 27	.. ..	C. L. Hooper
Do.	70 37	160 03	1849. 5	36 41	.. ..	H. Kellett
Point Comfort	70 43	152 14	1837. 6	43 08	.. ..	Th. Simpson
Boat Extreme	71 02	154 23	1837. 6	42 36	.. ..	Do.
Cape Smyth, signal station near Point Barrow	71 18	156 39	1889. 6	33 40	31 11	C. H. Stockton
Plover Point, Point Barrow	71 21	156 16	1853. 7	40 21	.. ..	R. Maguire

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

ARIZONA

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group I	° ′	° ′		*East* ° ′	*East* ° ′	
Nogales	31 20	110 56	1892.30	12 24.8	12 08	O. B. French
Yuma	32 44	114 37	1892.22	13 29.6	13 16	Do.
Group II						
Boundary Station 8	31 20	109 15	1892.6	11 56.9	11 40	J. F. Hayford
Boundary Station 9	31 20	109 43	1892.7	12 23.1	12 07	Do.
Boundary Station 10	31 20	110 10	1892.8	12 18.8	12 03	Do.
Boundary Station 11	31 20	110 34	1892.9	12 04.5	11 48	Do.
Cochise County, SE.	.. ..	... ..	1884	12 38	12 12	Mean, 15 stations
Cochise County, SW.	.. .	... ..	1885	12 20	11 54	Mean, 27 stations
Pima County, SE.	.. ..	... ..	1880	13 39	13 08	Mean, 38 stations
Pima County, central	.. ..	... ..	1886	12 49	12 29	Mean, 26 stations
Cochise County, NE.	.. ..	... ..	1884	12 51	12 25	Mean, 17 stations
Cochise County, NW.	.. ..	... ..	1880	12 58	12 27	Do.
Fort Bowie	32 10	109 20	1873.5	13 47.9	13 14	G. M. Wheeler
Tucson	32 14	110 58	1901.2	13 05	13 03	G. E. P. Smith
Pima County, NE.	.. ..	... ..	1870	13 17	12 42	Mean, 16 stations
Camp Grant	32 38	109 56	1895	12 25	12 13	Samuel Logan
San Pedro River	32 43	110 34	1873.5	12 49.3	12 15	S. E. Tillman
Gila Junction	32 43	114 33	1851.5	12 50	12 44	W. H. Emory
Duncan	32 44	109 06	1895	12 10	11 58	Samuel Logan
Graham County, SE.	.. ..	... ..	1883	12 30	12 02	Mean, 5 stations
Graham County, SW.	.. ..	... ..	1880	13 24	12 53	Mean, 18 stations
Yuma County, Lower Gila Valley	.. ..	... ..	1881	14 36	14 12	Mean, 27 stations
Solomonville	32 49	109 39	1895	12 25	12 13	Samuel Logan
Safford	32 50	109 44	1895	12 30	12 18	Do.
Pinal County, eastern	.. ..	... ..	1880	14 12	13 41	Mean, 19 stations
Pinal County, western	.. ..	... ..	1877	13 32	13 07	Mean, 42 stations
Yuma Co., Colorado Valley	.. ..	... ..	1875	13 36	13 11	Mean, 11 stations
Maricopa County, SW.	.. ..	... ..	1882	13 29	13 06	Mean, 31 stations
San Pedro	32 59	110 40	1851.5	12 25	12 03	W. H. Emory
Clifton	33 03	109 18	1895	12 17	12 05	Samuel Logan
Camp Thomas	33 03	110 00	1895	12 32	12 20	Do.
Pimos Villages	33 07	111 44	1851.5	12 52	12 30	W. H. Emory
Graham County, NW.	.. ..	... ..	1875	14 10	13 37	Mean, 2 stations
Graham County, NE.	.. ..	... ..	1887	12 30	12 06	Do.
Globe	33 23	110 47	1895	13 30	13 18	County surveyor
Big Hills	33 23	109 55	1873.5	13 06.1	12 32	S. E. Tillman
Prieto Crossing	33 34	109 55	1873.5	12 36.3	12 02	Do.
Maricopa County, east	.. ..	... ..	1876	13 40	13 15	Mean, 40 stations
Gila County, west	.. ..	... ..	1881	14 15	13 45	Mean, 9 stations
Camp Apache	33 47	109 57	1871.5	14 10.7	13 36	D. W. Lockwood
Escudilla Peak	33 59	109 06	1873.5	12 33.0	11 59	R. L. Hoxie
Bill Williams River	34 13	113 33	1854.1	13 41	13 32	J. C. Ives
Do.	34 17	113 26	1854.1	13 24	13 15	Do.
Apache County, south	.. ..	... ..	1882	13 45	13 16	Mean, 58 stations
Navajo County, south	.. ..	... ..	1883	13 58	13 30	Mean, 13 stations
Colorado River	34 23	114 06	1854.1	14 08	13 59	J. C. Ives
Yavapai County, SW.	.. ..	... ..	1874	14 05	13 40	Mean, 17 stations
Yavapai County, east	.. ..	... ..	1876	14 16	13 51	Mean, 21 stations
Tule Springs	34 32	109 06	1873.5	13 36.4	13 02	R. L. Hoxie
Big Sandy River	34 32	113 28	1854.1	13 58	13 49	J. C. Ives
Bouches Ford	34 33	110 04	1871.5	14 51.5	14 17	D. W. Lockwood

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

ARIZONA—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Big Sandy River	34 36	113 28	1854.1	14 02	13 53	J. C. Ives
Camp 130	34 36	114 16	1854.2	13 51	13 42	Do.
Camp 132	34 46	114 23	1854.2	13 36	13 27	Do.
Deer Spring	34 50	109 04	1873.5	13 53.5	13 20	R. L. Hoxie
Camp 135	34 52	114 32	1854.2	13 56	13 47	J. C. Ives
Little Colorado River	34 53	110 04	1853.9	13 42	13 17	Do.
Rattlesnake Canyon	34 56	112 17	1871.5	14 42.0	14 17	D. W. Lockwood
Pueblo Creek	34 56	112 46	1854.1	13 59	13 50	J. C. Ives
Near Puerco River	34 58	109 52	1853.9	14 00	13 35	Do.
Williams River	34 59	112 57	1854.1	14 48	14 39	Do.
Coconino County, south	.. ..	... ..	1883	14 40	14 18	Mean, 58 stations
Little Colorado River	35 00	110 25	1853.9	13 40	13 15	J. C. Ives
Do.	35 01	110 30	1853.9	13 21	12 56	Do.
Big Horse Spring	35 01	113 36	1854.1	14 18	14 09	Do.
Near Lithodendron Creek	35 02	109 41	1853.9	13 33	13 08	Do.
Camp Mohave	35 02	114 37	1875.7	14 45	14 20	E. Bergland
Jacobs Well	35 04	109 14	1853.9	13 44	13 19	J. C. Ives
Navajo Spring	35 06	109 20	1853.9	13 23	12 58	Do.
Carrito Creek	35 06	109 32	1853.9	13 54	13 29	Do.
Williams River	35 07	113 13	1854.1	13 40	13 31	Do.
White Cliff Creek	35 08	113 31	1854.1	14 42	14 33	Do.
Lockwood Springs	35 09	112 16	1871.5	14 22.0	13 57	D. W. Lockwood
Navajo County, middle	.. ..	... ..	1882	13 53	13 24	Mean, 78 stations
Yavapai County, NW.	.. ..	... ..	1880	14 09	13 44	Mean, 28 stations
Little Colorado River	35 12	110 37	1854.0	13 39	13 14	J. C. Ives
Apache County, middle	.. ..	... ..	1882	14 12	13 43	Mean, 94 stations
Saroux Spring	35 17	111 39	1854.0	13 52	13 27	J. C. Ives
Little Colorado River	35 18	110 53	1854.0	13 42	13 17	Do.
Mohave County, middle	.. ..	... ..	1876	15 00	14 35	Mean, 6 stations
Cedar Creek	35 21	112 20	1854.0	13 49	13 40	J. C. Ives
Canyon Spring	35 45	113 50	1871.5	14 06	13 41	D. W. Lockwood
Moencopie Canyon	36 08	111 08	1873.5	14 23.7	13 50	R. L. Hoxie
Green Springs	36 11	111 17	1873.5	15 28.4	14 55	Do.
Limestone Tanks	36 32	111 32	1873.5	15 15.7	14 42	Do.

ARKANSAS

Group I	° ′	° ′		*East* ° ′	*East* ° ′	
Camden	33 35	92 50	1901.33	6 49.4	6 47	W. Weinrich
Monticello	33 37	91 46	1901.31	6 14.5	6 12	Do.
Murfreesboro	34 04	93 42	1901.35	7 08.1	7 06	Do.
Pine Bluff	34 15	92 01	1901.33	6 27.2	6 25	Do.
Malvern	34 22	92 49	1901.36	6 03.6	6 01	Do.
Helena	34 32	90 35	1890.37	6 06.5	5 25	J. B. Baylor
Little Rock	34 44	92 16	1896.26	6 48.8	6 28	G. R. Putnam
Little Rock, fort	34 47	92 18	1901.37	6 35.9	6 34	Wallis & Weinrich
Searcy	35 15	91 45	1901.38	5 57.8	5 56	W. Weinrich
Newport	35 36	91 16	1901.48	5 22.6	5 21	Do.
Batesville	35 47	91 39	1901.47	6 28.2	6 26	Do.
Jonesboro	35 49	90 43	1901.44	5 17.8	5 16	Do.

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

ARKANSAS—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group I—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Evening Shade	36 04	91 38	1901.45	6 18.7	6 17	W. Weinrich
Walnut Ridge	36 04	90 59	1901.39	5 34.0	5 32	Do.
Paragould	36 05	90 32	1901.41	5 51.6	5 49	Do.
Corning	36 25	90 35	1901.40	5 52.4	5 50	Do.
Group II						
Union County	.. ..	.. ..	1854	7 45	6 15	Mean, 4 stations
Ashley County	.. ..	.. ..	1842	8 13	6 45	Mean, 21 stations
Columbia County	.. ..	.. ..	1857	7 37	6 09	Mean, 2 stations
Lafayette County	.. ..	.. ..	1842	7 10	5 42	Mean, 4 stations
Miller County	.. ..	.. ..	1842	7 47	6 19	Mean, 18 stations
Chicot County	.. ..	.. ..	1898	5 12.6	5 00	J. B. Daniels
Texarkana	33 24	94 00	1898.8	6 54	6 43	G. T. Hawkins
Bradley County	.. ..	.. ..	1842	8 30	7 02	1 station
Ouachita County	.. ..	.. ..	1853	7 00	5 30	Mean, 2 stations
Drew County	.. ..	.. ..	1844	7 50	6 20	Mean, 4 stations
Little River County	.. ..	.. ..	1837	8 10	6 45	Mean, 3 stations
Hempstead County	.. ..	.. ..	1838	8 00	6 35	Mean, 5 stations
Desha County	.. ..	.. ..	1843	7 05	5 36	Mean, 4 stations
Prescott	33 48	93 19	1898.8	6 11	6 00	G. T. Hawkins
Cleveland County	.. ..	.. ..	1844	8 12	6 42	Mean, 3 stations
Lincoln County	.. ..	.. ..	1840	8 40	7 12	Mean, 7 stations
Washita or Saline River	34 ..	92 ..	1804.5	8 20	6 26	W. Dunbar
Dallas County	.. ..	.. ..	1853	7 20	5 50	1 station
Sevier County	.. ..	.. ..	1856	9 05	7 36	Mean, 4 stations
Do.	.. ..	.. ..	1877	8 25	7 01	Boundary survey
Clark County	.. ..	.. ..	1850	7 40	6 08	Mean, 8 stations
Howard County	.. ..	.. ..	1843	8 15	6 46	1 station
Pike County	.. ..	.. ..	1842	7 56	6 28	Mean, 11 stations
Arkadelphia	34 06	92 59	1898.8	6 55	6 44	G. T. Hawkins
Grant County	.. ..	.. ..	1848	7 40	6 08	Mean, 6 stations
Jefferson County	.. ..	.. ..	1850	8 40	7 08	Mean, 4 stations
Arkansas County	.. ..	.. ..	1849	7 24	5 52	Mean, 12 stations
Hot Spring County	.. ..	.. ..	1850	7 30	5 58	Mean, 9 stations
Malvern	34 21	92 45	1898.8	5 23	5 12	G. T. Hawkins
Phillips County	.. ..	.. ..	1844	8 05	6 35	Mean, 5 stations
Polk County	.. ..	.. ..	1844	8 17	6 47	Mean, 25 stations
Do.	.. ..	.. ..	1877	8 35	7 11	Boundary survey
Montgomery County	.. ..	.. ..	1845	8 00	6 30	Mean, 20 stations
Hot Springs	34 30	93 03	1895	7 26	7 03	County surveyor
Garland County	.. ..	.. ..	1845	8 20	6 50	Mean, 10 stations
Benton	34 33	92 35	1898.8	7 01	6 50	G. T. Hawkins
Saline County	.. ..	.. ..	1845	7 55	6 25	Mean, 6 stations
Mena	34 35	94 14	1898.9	7 39	7 28	G. T. Hawkins
Monroe County	34 37	91 15	1898.7	5 00	4 48	R. S. Watkins
Do.	.. ..	.. ..	1845	7 18	5 48	Mean, 9 stations
Clarendon	34 43	91 20	1888.9	6 58	6 11	C. E. Taft
Lee County	.. ..	.. ..	1855	7 30	6 00	Mean, 2 stations
Marianna	34 47	90 45	1888.9	6 18	5 31	C. E. Taft
Lonoke County	.. ..	.. ..	1854	7 10	5 40	Mean, 16 stations
Lonoke	34 49	91 54	1888.9	6 58	6 11	C. E. Taft
Pulaski County	.. ..	.. ..	1853	7 45	6 15	Mean, 12 stations
Williams Landing	34 50	92 30	1870.3	7 16	5 31	S. T. Abert

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

ARKANSAS—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Scott County	.. ..	.. ..	1844	7 57	6 27	Mean, 25 stations
Do.	.. ..	.. ..	1877	8 42	7 18	Boundary survey
Prairie County	.. ..	.. ..	1847	7 35	6 05	Mean, 20 stations
Blues Point	34 50	90 26	1879.2	6 14	4 55	J. A. Ockerson
Opposite Buck Island	34 52	90 20	1879.1	6 34	5 14	J. Eisenmann
Nelms Triangulation Sta.	34 58	90 15	1879.2	6 22	5 03	J. H. Darling
Perry County	.. ..	.. ..	1843	8 00	6 31	Mean, 8 stations
Scanlan Landing	35 02	90 16	1878.1	6 57	5 35	C. F. Powell
Forrest City	35 02	90 49	1888.9	6 13	5 26	C. E. Taft
St. Francis County	.. ..	.. ..	1849	7 22	5 50	Mean, 5 stations
Yell County	.. ..	.. ..	1839	8 06	6 39	Mean, 20 stations
Danville	35 03	93 24	1895	6 10	5 47	County surveyor
Isaac Creek	35 04	92 39	1870.3	7 30	5 45	S. T. Abert
Stouts Landing	35 07	92 50	1870.3	7 44	5 59	Do.
Crittenden County	.. ..	.. ..	1845	7 40	6 10	Mean, 2 stations
Woodruff County	.. ..	.. ..	1843	7 40	6 11	Mean, 11 stations
Faulkner County	.. ..	.. ..	1847	7 48	6 18	Mean, 6 stations
Sebastian County	.. ..	.. ..	1877	8 52	7 28	Boundary survey
Greenwood	35 12	94 16	1889.0	7 48	7 02	C. E. Taft
Wynne	35 14	90 47	1901	5 35	5 32	Newsom & Co.
Logan County	.. ..	.. ..	1841	8 25	6 57	Mean, 8 stations
White County	.. ..	.. ..	1851	7 10	5 39	Mean, 16 stations
Hog Thief Bend	35 17	93 03	1870.3	8 19	6 34	S. T. Abert
Delaware Creek	35 17	93 15	1870.3	8 25	6 40	Do.
Charleston	35 18	94 04	1889.0	7 58	7 12	C. E. Taft
Cross County	.. ..	.. ..	1846	7 30	6 00	Mean, 8 stations
Shoal Creek	35 20	93 25	1870.3	8 30	6 45	S. T. Abert
Roseville	35 22	93 47	1870.3	8 50	7 05	Do.
Profile Rock	35 23	93 31	1870.3	8 34	6 49	Do.
Fort Smith	35 23	94 26	1889.0	8 23	7 37	C. E. Taft
Pope County	.. ..	.. ..	1843	7 40	6 11	Mean, 8 stations
Earns Landing	35 27	94 04	1870.3	9 00	7 15	S. T. Abert
Clarksville	35 28	93 30	1889.0	7 18	6 32	C. E. Taft
Franklin County	.. ..	.. ..	1845	8 00	6 30	Mean, 6 stations
Cleburne County	.. ..	.. ..	1843	7 35	6 06	Mean, 12 stations
Crawford County	.. ..	.. ..	1877	9 15	7 51	Boundary survey
Johnson County	.. ..	.. ..	1844	7 40	6 10	Mean, 9 stations
Van Buren County	.. ..	.. ..	1843	7 35	6 06	Mean, 14 stations
Poinsett County	.. ..	.. ..	1848	7 35	6 04	Mean, 18 stations
Snapp	35 36	91 13	1895	5 54	5 31	County surveyor
Jackson County	.. ..	.. ..	1840	7 25	5 58	Mean, 12 stations
Mississippi County	.. ..	.. ..	1844	7 48	6 18	Mean, 32 stations
Independence County	.. ..	.. ..	1853	7 20	5 50	Mean, 13 stations
Craighead County	.. ..	.. ..	1849	7 00	5 28	Do.
Stone County	.. ..	.. ..	1844	7 30	6 00	Mean, 2 stations
Searcy County	.. ..	.. ..	1844	7 35	6 05	Mean, 12 stations
Washington County	.. ..	.. ..	1877	9 10	7 46	Boundary survey
Newton County	.. ..	.. ..	1844	7 36	6 06	Mean, 27 stations
Madison County	.. ..	.. ..	1841	7 50	6 22	Do.
Fayetteville	36 02	94 09	1889.0	7 58	7 12	A. Winslow
Lawrence County	.. ..	.. ..	1848	7 15	5 44	Mean, 12 stations
Izard County	.. ..	.. ..	1852	7 10	5 39	Mean, 4 stations
Sharp County	.. ..	.. ..	1853	7 30	6 00	Mean, 6 stations
Buffalo	36 12	92 30	1878.5	8 00	6 39	Sutler & Wellman
Greene County	.. ..	.. ..	1855	7 25	5 55	Mean, 11 stations

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

ARKANSAS—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Marion County	.. ..	.. ..	1840	7 43	6 16	Mean, 23 stations
Baxter County	.. ..	.. ..	1845	8 53	6 23	Boundary survey
Do.	.. ..	.. ..	1847	8 10	6 40	One station
Benton County	.. ..	.. ..	1877	9 33	8 09	Boundary survey
Boone County	.. ..	.. ..	1846	7 56	6 26	Mean, 12 stations
Randolph County	.. ..	.. ..	1852	7 20	5 49	Mean, 5 stations.
Carroll County	.. ..	.. ..	1845	8 00	6 30	Mean, 15 stations
Berryville	36 24	93 38	1901.2	7 06	7 03	J. B. Potter
Clay County	.. ..	.. ..	1846	7 25	5 55	Mean, 13 stations
Fulton County	.. ..	.. ..	1852	7 38	6 07	Mean, 6 stations
Do.	.. ..	.. ..	1845	8 17	5 47	Boundary survey

CALIFORNIA

Group I	° ′	° ′		*East* ° ′	*East* ° ′	
San Diego, La Playa	32 42	117 14	1897.12	13 30.9	13 31	O. B. French
San Diego	32 43	117 10	1892.09	13 56.4	13 56	G. R. Putnam
Foster	32 54	116 55	1897.13	14 21.8	14 22	O. B. French
Oceanside	33 12	117 24	1897.11	14 56.6	14 57	Do.
Capistrano	33 30	117 40	1897.11	14 31.1	14 31	Do.
Newport Beach	33 36	117 55	1897.10	14 30.6	14 31	Do.
Elsinore	33 40	117 20	1897.16	13 53.4	13 53	Do.
Indio	33 43	116 12	1897.17	14 15.7	14 16	Do.
San Pedro	33 44	118 17	1897.09	14 32.2	14 32	Do.
San Jacinto	33 47	116 57	1897.15	14 11.3	14 11	Do.
Los Angeles, SE. Base	33 48	117 57	1890.33	13 25.6	13 26	J. J. Gilbert
Dominguez Hill	33 52	118 14	1870.18	15 20.8	15 24	Throckmorton
Los Angeles, NW. Base	33 55	118 04	1890.43	14 27.2	14 27	I. Winston
Santa Monica	34 01	118 30	1897.08	14 34.7	14 35	O. B. French
Los Angeles, magnetic obsy.	34 03	118 15	1889.38	14 23.0	14 23	R. E. Halter
Los Angeles	34 04	118 15	1892.14	14 27.4	14 27	G. R. Putnam
North Pomona	34 06	117 45	1897.08	14 41.7	14 42	O. B. French
San Bernardino	34 06	117 18	1897.07	14 35.3	14 35	Do.
Ventura	34 17	119 18	1897.02	14 48.3	14 48	H. P. Ritter
Saugus	34 24	118 33	1897.03	14 48.3	14 48	Do.
Santa Barbara	34 25	119 42	1897.02	14 58.4	14 58	Do.
Point Conception	34 27	120 27	1872.93	14 51.8	14 53	Throckmorton
Bagdad	34 35	115 53	1897.03	14 29.6	14 30	O. B. French
Oro Grande	34 35	117 20	1897.06	15 18.7	15 19	Do.
Palmdale	34 35	118 07	1897.05	14 50.8	14 51	H. P. Ritter
Los Olivos	34 40	120 07	1897.01	15 12.1	15 12	Do.
Needles	34 50	114 36	1895.18	14 13.7	14 14	E. Smith
Barstow	34 54	117 01	1897.02	14 52.8	14 53	O. B. French
Blake	34 55	115 04	1897.06	14 41.1	14 41	Do.
Santa Maria	34 58	120 26	1897.00	15 28.1	15 28	H. P. Ritter
Kramer	34 59	117 36	1897.02	14 57.3	14 57	O. B. French
Cal. & Nev. Bound. 35° Post	35 00	114 39	1893.48	14 37.3	14 37	C. H. Sinclair
Mojave	35 03	118 10	1897.05	15 00.6	15 01	H. P. Ritter
Port Harford	35 10	120 45	1896.98	15 06.0	15 06	Do.
San Luis Obispo	35 11	120 44	1881.29	15 36.7	15 37	H. E. Nichols
Manvel	35 17	115 14	1897.04	16 02.8	16 03	O. B. French

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

CALIFORNIA—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group I—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Caliente	35 18	118 38	1897.06	15 09.0	15 09	H. P. Ritter
Asphalto	35 19	119 36	1897.08	15 35.7	15 36	Do.
Santa Margarita	35 23	120 37	1896.97	15 54.1	15 54	Do.
Delano	35 47	119 16	1897.09	15 34.9	15 41	Do.
Bradley	35 51	120 48	1896.96	15 59.0	16 05	Do.
San Lucas	36 08	121 01	1896.95	16 02.1	16 08	Do.
Huron	36 13	120 06	1897.11	16 05.8	16 12	Do.
Visalia	36 21	119 17	1897.10	15 59.1	16 05	Do.
Soledad	36 26	121 20	1896.94	16 14.8	16 21	Do.
Mount Toro	36 32	121 36	1885.08	15 56.8	16 14	F. Morse
Monterey	36 36	121 54	1896.04	16 14.6	16 22	Do.
Point Pinos	36 38	121 56	1873.66	15 55.3	16 23	Throckmorton
Salinas	36 40	121 40	1896.93	16 17.7	16 24	H. P. Ritter
Fresno	36 44	119 48	1897.13	15 53.3	15 59	Do.
Mendota	36 46	120 22	1897.14	16 13.9	16 20	Do.
Hollister	36 51	121 28	1896.89	16 09.1	16 15	Do.
Santa Cruz	36 57	122 02	1896.92	16 31.3	16 37	Do.
Madera	36 59	120 03	1897.16	15 32.2	15 38	Do.
Volta	37 07	120 56	1897.15	17 05.1	17 11	Do.
Loma Prieta	37 07	121 51	1884.18	16 06.1	16 24	R. A. Marr
San Jose	37 16	121 53	1896.89	17 48.5	17 55	H. P. Ritter
Merced	37 18	120 28	1897.17	15 33.4	15 39	Do.
Mt. Hamilton, Lick Obsy.	37 20	121 38	1900.93	16 27	16 27	L. A. Bauer
Sierra Morena	37 24	122 18	1884.03	16 38.6	16 56	R. A. Marr
Mocho	37 29	121 33	1887.66	16 35.4	16 51	F. Morse
Modesto	37 38	120 59	1897.19	16 26.0	16 32	H. P. Ritter
Altamont	37 45	121 40	1897.20	17 11.4	17 17	Do.
Presidio, San Francisco	37 48	122 27	1898.17	16 55.0	17 00	Do.
Mount Diablo	37 53	121 55	1884.91	16 42.5	17 00	R. A. Marr
Mount Tamalpais	37 55	122 36	1879.84	16 00	16 20	E. Hergesheimer
Mount Conness	37 58	119 19	1890.66	15 15.4	15 28	I. Winston
Stockton	37 58	121 17	1897.22	16 57.8	17 04	H. P. Ritter
San Rafael	37 59	122 33	1897.68	17 11.3	17 17	Do.
Punta de los Reyes	38 00	122 59	1853.1	15 35	16 35	Davidson, Lawson
Milton	38 03	120 51	1897.21	15 37.6	15 44	H. P. Ritter
Mare Island Navy-Yard	38 06	122 16	1887.28	17 07.6	17 24	C. C. Marsh
Tomales Bay	38 11	122 57	1857.10	16 00.4	16 53	G. Davidson
Fairfield	38 15	122 02	1897.73	17 33.0	17 39	H. P. Ritter
Napa	38 17	122 15	1898.05	17 38.4	17 44	Do.
Bodega	38 18	123 00	1860.56	16 18.8	17 05	G. Davidson
Vaca	38 22	122 05	1880.89	17 11.6	17 31	E. F. Dickins
Santa Rosa	38 27	122 43	1897.46	17 28.5	17 34	H. P. Ritter
Ross Mountain	38 30	123 07	1860.04	16 23.2	17 10	G. Davidson
Sacramento	38 33	121 29	1897.79	16 05.6	16 11	H. P. Ritter
Woodland	38 40	121 47	1898.03	18 10.0	18 15	Do.
Monticello	38 40	122 11	1880.77	17 12.8	17 33	J. J. Gilbert
Placerville	38 45	120 48	1897.77	18 20.4	18 26	H. P. Ritter
Auburn	38 55	121 04	1897.75	17 40.5	17 46	Do.
Point Arena	38 55	123 42	1889.12	17 12.7	17 15	R. A. Marr
Lake Tahoe	38 55	120 05	1879.72	16 48	16 54	E. Hergesheimer
Lake Tahoe, southeast	38 57	119 57	1895.83	16 57.2	17 00	C H. Sinclair
Cold Spring	39 01	123 31	1891.80	17 23.6	17 25	E. F. Dickins
Ukiah	39 08	123 13	1897.71	17 45.0	17 45	H. P. Ritter
Marysville	39 09	121 36	1897.80	16 53.7	16 54	Do.
Colusa	39 12	122 02	1898.00	18 07.2	18 07	Do.

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

CALIFORNIA—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group I—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Blue Canyon	39 15	120 47	1881.27	15 38.4	15 42	Eimbeck & Marr
Nevada City	39 17	121 02	1897.74	17 57.1	17 57	H. P. Ritter
Snow Mountain, west	39 22	122 46	1892.41	18 00.3	18 02	E. F. Dickins
Oroville	39 30	121 34	1897.82	17 24.8	17 25	H. P. Ritter
Willows	39 31	122 12	1897.98	18 14.1	18 14	Do.
Red Bluff	40 12	122 15	1897.84	18 29.6	18 30	Do.
Mount Lassic	40 20	123 33	1892.73	19 38.9	19 40	E. F. Dickins
Cape Mendocino	40 26	124 24	1886.27	18 00.5	18 06	F. Morse
Redding	40 36	122 24	1897.96	18 31.5	18 32	H. P. Ritter
Humboldt, Red Bluff	40 45	124 13	1854.33	17 04.5	17 58	Davidson & Tod
Bucksport	40 47	124 12	1853.55	17 06.5	18 01	G. Davidson
Eureka	40 48	124 10	1871.58	18 42.4	19 03	Do.
Group II						
Camp Riley	32 36	117 05	1849.5	12 57	13 26	W. H. Emory
San Diego County, east	.. ..	... ..	1876	13 46	13 34	1 station
San Diego County, west	.. ..	... ..	1868	13 23	13 28	Mean, 5 stations
San Isabel	33 09	116 38	1852.5	12 34	12 59	W. H. Emory
Orange County	.. ..	... ..	1880	14 00	14 00	Mean, 2 stations
Riverside County	33 47	116 56	1900.5	14 30	14 30	G. M. Pearson
Riverside	33 58	117 22	1896	14 30	14 30	County surveyor
Los Angeles County	.. ..	... ..	1883	14 40	14 40	Mean, 4 stations
Santa Barbara	34 25	119 42	1901.3	15 12	15 12	F. F. Flournoy
Ventura County	.. ..	... ..	1876	15 04	15 05	Mean, 2 stations
San Bernardino Co., SE.	.. ..	... ..	1882	14 46	14 34	Mean, 6 stations
San Bernardino Co., SW.	.. ..	... ..	1865	14 00	14 08	1 station
Santa Barbara County	.. ..	... ..	1884	14 45	14 45	Mean, 6 stations
Old Fort Tejon	34 52	118 55	1875.5	14 54.5	14 56	G. M. Wheeler
Soda Lake	35 03	115 59	1854.2	13 51	14 13	J. C. Ives
Pai-ute Creek	35 06	114 54	1854.2	14 17	14 39	Do.
Tchachipai Valley	35 07	118 28	1875.5	14 12.0	14 13	A. W. Whipple
Los Angeles and Calientes Road	35 08	118 09	1875.5	14 47.7	14 49	R. Birnie
Near Marl Springs	35 11	115 33	1854.2	13 59	14 21	J. C. Ives
Kern County, east	.. ..	... ..	1880	15 02	15 02	Mean, 9 stations
Kern County, west	.. ..	... ..	1882	15 40	15 40	Mean, 5 stations
Desert Springs	35 18	117 57	1871.5	15 31	15 33	D. W. Lockwood
San Bernardino Co., NE.	.. ..	... ..	1865	14 17	14 25	Mean, 4 stations
San Bernardino Co., NW.	.. ..	... ..	1859	15 50	16 04	1 station
San Luis Obispo County	.. ..	... ..	1879	15 06	15 27	Mean, 6 stations
Indian Well	35 40	117 53	1875.5	15 12.5	15 14	Engineer officer
Saratoga Springs	35 41	116 26	1871.5	15 05	15 06	D. W. Lockwood
Penamint Valley	36 05	117 14	1875.5	15 10.6	15 12	R. Birnie
Tulare County, east	.. ..	... ..	1873	14 35	15 03	1 station
Inyo County, south	.. ..	... ..	1877	15 15	15 16	Mean, 14 stations
Wild Rose Spring	36 16	117 12	1875.5	15 19.2	15 21	R. Birnie
Passmore Post-Office	36 17	118 00	1875.5	14 54	14 55	Engineer officer
Hanford	36 20	119 39	1887	15 30	15 46	County surveyor
Monterey County	.. ..	... ..	1882	15 49	16 07	Mean, 5 stations
Furnace Creek	36 26	116 51	1875.5	15 41	15 42	R. Birnie
Cerro Gordo Landing	36 28	117 51	1875.5	15 18.7	15 20	Do.
Fresno County, west	.. ..	... ..	1868	16 12	16 46	Mean, 2 stations
Lone Pine Camp	36 36	118 04	1875.5	15 20	15 45	Engineer officer
Camp Independence	36 50	118 13	1871.5	15 33.7	16 04	Do.

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

CALIFORNIA—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Inyo County, north	.. ..	... ..	1880	16 09	16 29	Mean, 5 stations
Off Santa Cruz	36 56	121 57	1891.8	16 15	16 27	Z. L. Tanner
Fresno County, east	.. ..	... ..	1878	15 34	15 56	Mean, 4 stations
Santa Clara County	.. ..	... ..	1880	16 20	16 40	Mean, 20 stations
San Mateo County	.. ..	... ..	1865	15 45	16 24	1 station
Stanislaus County	.. ..	... ..	1866	15 20	15 57	Do.
Mariposa County	.. ..	... ..	1875	15 40	16 06	Mean, 2 stations
Alameda County	.. ..	... ..	1864	17 07	17 47	Mean, 3 stations
Mono Lake	37 51	118 58	1900	17 00	17 02	J. G. Thompson
Mono County	.. ..	... ..	1885	17 02	17 19	Mean, 10 stations
Contra Costa County	.. ..	... ..	1869	16 40	17 13	Mean, 7 stations
New York	38 03	121 49	1850.0	15 41.8	16 48	Chart, C. Ringold
Marin County	.. ..	... ..	1863	15 52	16 34	Mean, 3 stations
Tuolumne County	.. ..	... ..	1874	16 00	16 27	Mean, 7 stations
Opposite Mare I. Navy-Yd.	38 06	122 16	1888.8	17 14	17 29	G. F. F. Wilde
Suisun City	38 11	122 02	1850.0	15 40.5	16 46	Chart, C. Ringold
Solano County	38 11	122 13	1894.2	17 30	17 39	E. N. Eager
Do.	.. ..	... ..	1875	17 00	17 26	Mean, 12 stations
Calaveras County	.. ..	... ..	1872	16 20	16 49	Mean, 5 stations
Solano County	38 18	121 56	1889.9	17 30	17 44	E. N. Eager
Barbers	38 19	121 30	1850.0	16 20.0	17 26	Chart, C. Ringold
Railroad Flat	38 21	120 30	1884	16 36	16 53	County surveyor
Solano County	38 24	122 01	1883.7	17 30	17 48	E. N. Eager
Amador County	.. ..	... ..	1873	16 15	16 43	Mean, 3 stations
Napa County	.. ..	... ..	1879	16 54	17 15	Mean, 5 stations
St. Helena	38 29	122 28	1901.3	16 55	16 56	J. M. Graham
Sonoma County	.. ..	... ..	1860	16 22	17 08	Mean, 2 stations
Sacramento County	.. ..	... ..	1880	16 00	16 20	Mean, 4 stations
Alpine County	.. ..	... ..	1877	16 45	17 08	1 station
Eldorado County	.. ..	... ..	1870	16 18	16 50	Mean, 8 stations
Yolo County	.. ..	... ..	1872	16 00	16 29	1 station
Armstrong Ranch	38 50	119 47	1877.0	16 45	16 52	Engineer officer
Yanks Landg., Lake Tahoe	38 56	120 03	1876.5	15 51	15 59	Do.
Rowland	38 57	119 59	1876.5	15 51	15 59	Do.
Rubicon Point	39 00	120 06	1876.5	15 37	15 46	Do.
Lusks	39 02	120 07	1876.5	15 37	15 46	Do.
Placer County	.. ..	... ..	1871	16 06	16 20	Mean, 16 stations
Sutter County	.. ..	... ..	1874	15 25	15 42	Mean, 3 stations
Lake County	.. ..	... ..	1880	17 15	17 25	Mean, 2 stations
Yuba	39 09	121 39	1894	15 15	15 16	C. W. Guptill
Colusa County	.. ..	... ..	1884	16 43	16 49	Mean, 3 stations
Mendocino County, south	.. ..	... ..	1874	17 06	17 23	Mean, 8 stations
Boundary monument, north shore, Lake Tahoe	39 13	120 00	1876.5	15 51	15 59	Engineer officer
Hot Springs	39 14	120 01	1876.5	18 01	18 10	Do.
Cisco	39 19	120 33	1877.5	17 11	17 20	J. N. Macomb
Yuba County	.. ..	... ..	1879	17 06	17 17	Mean, 4 stations
Nevada County	.. ..	... ..	1868	17 07	17 25	Mean, 5 stations
Willows	39 31	122 12	1901	18 05	18 05	J. F. Weston
Glenn County	39 31	122 00	1901	18 05	18 05	Do.
Do.	39 31	122 30	1901	17 30	17 30	Do.
Sierra County	.. ..	... ..	1867	17 05	17 25	Mean, 10 stations
Butte County	.. ..	... ..	1868	17 00	17 26	Mean, 8 stations
Mendocino Co., north	.. ..	... ..	1892	18 03	18 04	Mean, 2 stations
Orland	39 45	122 12	1892	17 40	17 41	County surveyor

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

CALIFORNIA—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Plumas County	.. ..	.... ..	1868	17 06	17 24	Mean, 9 stations
Shelter Cove	40 03	124 09	1792.3	15 00	.. ..	G. Vancouver
Tehama County	.. ..	.... ..	1869	17 41	18 05	Mean, 5 stations
Red Bluff	40 12	122 15	1901	18 30	18 30	W. F. Luning
Susanville	40 25	120 40	1877.5	18 21	18 34	Engineer officer
Lassen County	.. ..	.... ..	1869	17 24	17 40	Mean, 16 stations
Trinity County	.. ..	.... ..	1873	18 15	18 33	Mean, 3 stations
Shasta County	.. ..	.... ..	1869	17 34	17 58	Mean, 7 stations
Humboldt County	.. ..	.... ..	1861	17 23	18 02	Mean, 5 stations
Humboldt Bay, entrance	40 45	124 14	1895.8	18 18	18 18	Engineer officer
Off Trinidad	41 07	124 16	1841.5	16 00	17 28	Duflot de Mofras
Modoc County	.. ..	.... ..	1872	17 22	17 35	Mean, 11 stations
Siskiyou County, east	.. ..	.... ..	1887	18 50	18 54	Mean, 2 stations
Siskiyou County, west	.. ..	.... ..	1875	19 36	19 52	1 station
Yreka	41 44	122 40	1894	19 34	19 35	County surveyor
Fort Bidwell	41 52	120 09	1877.5	17 53	18 06	T. W. Symons

COLORADO

Group I	° ′	° ′		*East* ° ′	*East* ° ′	
Conejos	37 06	106 01	1899.89	13 01.8	12 57	J. A. Fleming
Trinidad	37 10	104 30	1888.86	13 46.6	13 14	J. B. Baylor
Springfield	37 24	102 36	1900.88	12 36.4	12 34	W. C. Dibrell
West Las Animas	38 04	103 13	1888.81	12 59.8	12 27	J. B. Baylor
Uncompahgre	38 04	107 28	1895.64	14 53.7	14 39	R. L. Faris
Lamar	38 05	102 37	1900.87	12 04.7	12 02	W. C. Dibrell
Pueblo	38 14	104 38	1899.88	12 50.9	12 46	J. A. Fleming
Plateau	38 23	104 33	1894.60	13 02.5	12 44	F. D. Granger
Mount Ouray	38 25	106 14	1894.57	14 17.8	14 02	R. L. Faris
Sheridan Lake	38 28	102 17	1900.86	12 16.1	12 13	W. C. Dibrell
Gunnison	38 33	106 56	1886.46	14 43.2	14 08	E. Smith
Arapahoe	38 46	102 05	1892.65	13 18.0	12 54	F. W. Perkins
First View	38 48	102 32	1892.85	12 15.4	11 52	Do.
Cheyenne Wells	38 49	102 20	1900.85	12 08.4	12 06	W. C. Dibrell
Colorado Springs	38 50	104 49	1886.52	14 23.6	13 46	E. Smith
Pikes Peak	38 50	105 03	1895.57	13 55.0	13 38	J. Nelson
Chiquita	38 54	108 39	1895.41	14 49.4	14 34	W. Eimbeck
Cheyenne Wells	38 57	102 24	1892.82	12 39.2	12 18	F. W. Perkins
Landsman	38 57	102 35	1892.77	12 38.1	12 17	Do.
Mount Treasury	39 00	107 06	1893.66	14 22.2	14 03	R. L. Faris
Monotony	39 02	102 14	1892.66	12 33.5	12 09	F. W. Perkins
Grand Junction	39 04	108 34	1895.38	14 39.9	14 25	R. L. Faris
Mount Elbert	39 07	106 27	1894.55	15 01.1	14 44	P. A. Welker
Burlington	39 18	102 16	1900.85	12 15.8	12 13	W. C. Dibrell
Tavaputs	39 32	109 00	1891.80	14 58.2	14 35	P. A. Welker
Gerdts	39 42	102 40	1900.84	13 39.2	13 36	W. C. Dibrell
Denver	39 46	104 54	1899.87	14 01.8	13 56	J. A. Fleming
Yuma	40 08	102 41	1900.83	12 58.4	12 56	W. C. Dibrell
Akron	40 10	103 13	1900.83	13 06.4	13 04	Do.
Greeley	40 26	104 40	1878.69	14 33.7	13 42	J. B. Baylor
Sterling	40 37	103 13	1900.83	13 03.9	13 01	W. C. Dibrell

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

COLORADO—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II	° ′	° ′		*East* ° ′	*East* ° ′	
La Costilla	37 00	105 30	1872.1	14 26	13 32	C. J. Moore
Colonas Ferry	37 05	105 45	1877.5	11 04.2	10 16	Engineer officer
San Luis	37 13	105 26	1895	13 14	12 58	County surveyor
Conejos Count	.. ..	... ..	1876	14 07	13 18	Mean, 5 stations
Purgatoire River, head of north fork	37 18	104 19	1873.5	14 22.8	13 24	W. L. Marshall
Las Animas County, east	.. ..	... ..	1871	13 25	12 25	Mean, 4 stations
Las Animas County, west	.. ..	... ..	1869	13 34	12 32	Mean, 7 stations
Baca County	.. ..	... ..	1873	13 45	12 47	Mean, 3 stations
La Plata County	.. ..	... ..	1879	14 32	13 50	Mean, 8 stations
Montezuma County	.. ..	... ..	1880	14 20	13 39	Mean, 3 stations
Mancos	37 21	108 18	1895	13 22	13 07	County surveyor
Jan Juan River	37 23	106 46	1874.5	14 58.4	14 12	W. L. Marshall
Costilla County	.. ..	... ..	1871	14 11	13 16	Mean, 7 stations
Fort Garland	37 26	105 26	1873.5	14 07.1	13 15	W. L. Marshall
San Juan River	37 26	106 47	1874.5	15 01	14 15	Do.
East Boundary	37 30	102 03	1872.9	12 30	11 22	J. J. Major
Cucharas River	37 30	105 01	1873.5	14 00.6	13 03	W. L. Marshall
Dolores River	37 31	108 04	1874.5	14 00	13 14	A. W. Whipple
La Veta Creek	37 32	105 03	1873.5	14 07.3	13 09	W. L. Marshall
Rio Grande County	.. ..	... ..	1874	14 16	13 30	Mean, 9 stations
Huerfano County	.. ..	... ..	1866	14 27	13 30	Mean, 6 stations
La Loma	37 41	106 14	1873.5	14 53	14 00	W. L. Marshall
Del Norte	37 41	106 21	1895	13 59	13 43	County surveyor
Simpson Peak	37 41	107 22	1874.5	14 30	13 44	W. L. Marshall
Diana Creek	37 42	107 48	1874.5	14 32	13 46	Do.
Rio Grande	37 45	107 27	1874.5	14 50	14 04	Do.
San Juan County	.. ..	... ..	1875	14 05	13 19	Mean, 2 stations
Dolores County	.. ..	... ..	1885	14 20	13 46	Mean, 4 stations
East Boundary	37 47	102 03	1872.9	13 00	11 52	J. J. Major
Dolores River	37 47	107 57	1874.5	14 09.6	13 24	A. W. Whipple
San Juan mines	37 50	107 35	1873.5	14 38.6	13 52	W. L. Marshall
Hinsdale County	.. ..	... ..	1881	14 26	13 46	Mean, 4 stations
Prowers County	.. ..	... ..	....	.. ..	12 15	Mean, 3 stations
Bent County	.. ..	... ..	1871	13 40	12 40	Mean, 5 stations
San Miguel County	.. ..	... ..	1881	14 20	13 40	Mean, 4 stations
La Junta	38 00	103 32	1900.5	12 45	12 41	F. F. Lewis
Wet Mountain Valley	38 02	105 25	1873.5	14 20	13 28	W. L. Marshall
Saguache, Craigs Ranch	38 02	106 37	1873.5	14 34.7	13 42	Do.
Ouray	38 03	107 41	1895	13 55	13 40	County surveyor
Custer County	38 03	105 17	1901.2	13 30	13 28	Carl Wulsten
Do.	.. ..	... ..	1871	14 21	13 26	Mean, 4 stations
Las Animas	38 04	103 13	1889.7	12 58	12 27	F. F. Lewis
Otero County	.. ..	... ..	1871	13 56	12 56	Mean, 12 stations
Saguache County	.. ..	... ..	1876	14 10	13 25	Mean, 14 stations
East Boundary	38 08	102 03	1872.9	13 05	11 57	J. J. Major
Fort Lyon	38 08	102 50	1866.5	14 30	13 26	J. Prince
Pueblo County	.. ..	... ..	1869	14 37	13 35	Mean, 12 stations
Ouray County	.. ..	... ..	1881	14 46	14 06	Mean, 3 stations
Los Pinos Indian Agency	38 12	106 49	1874.5	14 50	14 04	W. L. Marshall
East Boundary	38 15	102 03	1872.9	13 10	12 02	J. J. Major
Hayden Creek	38 20	105 47	1874.5	14 05.5	13 14	W. L. Marshall
Montrose County, west	.. ..	... ..	1888	14 24	13 55	Mean, 8 stations

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

COLORADO—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Kiowa County	.. ..	... ..	1871	13 25	12 25	Mean, 2 stations
Fremont County	.. ..	... ..	1877	14 27	13 38	Mean, 7 stations
East Boundary	38 25	102 03	1872.8	13 30	12 22	J. J. Major
Arkansas River	38 28	105 51	1873.5	14 41	13 48	W. L. Marshall
Montrose County, east	.. ..	... ..	1884	14 25	13 50	Mean, 5 stations
Gunnison County	.. ..	... ..	1882	14 44	14 06	Mean, 13 stations
Currant Creek	38 40	105 30	1873.5	14 24.1	13 32	W. L. Marshall
High Creek	38 41	105 18	1873.5	15 00.7	14 08	Do.
Delta	38 45	108 03	1900	14 32	14 28	J. A. Curtiss
Lincoln County, south	.. ..	... ..	1870	14 12	13 10	Mean, 7 stations
Chaffee County	.. ..	... ..	1876	15 12	14 27	Mean, 4 stations
Buffalo Slough	38 48	105 42	1873.5	14 24.7	13 32	W. L. Marshall
Cheyenne County	.. ..	... ..	1870	13 50	12 38	Mean, 4 stations
El Paso County	.. ..	... ..	1869	14 57	14 01	Mean, 9 stations
Paonia	38 52	107 36	1900	15 15	15 11	J. A. Curtiss
Delta County, average	.. ..	... ..	1901	14 35	14 34	Do.
20 miles north of Delta	39 00	108 00	1900	14 25	14 21	Do.
East Boundary	39 01	102 03	1872.8	13 30	12 22	J. J. Major
Grand Junction	39 04	108 34	1895	14 48	14 31	County surveyor
Mesa County, east	.. ..	... ..	1892	15 05	14 43	Mean, 4 stations
Lake County	.. ..	... ..	1875	15 40	14 49	1 station
Pitkin County	.. ..	... ..	1891	15 02	14 38	Mean, 3 stations
Aspen	39 11	106 50	1895	15 00	14 44	County surveyor
Park County	.. ..	... ..	1872	15 36	14 43	Mean, 8 stations
Fairplay	39 14	106 00	1879.5	14 26	13 40	Engineer officer
Alma	39 15	106 02	1895	13 50	13 34	W. H. Powless
Lincoln County, north	.. ..	... ..	1870	14 10	13 08	Mean, 2 stations
Kit Carson County	.. ..	... ..	1870	14 00	12 48	Do.
Douglas County	.. ..	... ..	1866	15 10	14 13	Mean, 6 stations
Elbert County	.. ..	... ..	1866	14 22	13 25	Mean, 7 stations
East Boundary	39 26	102 03	1872.8	13 35	12 27	J. J. Major
Breckinridge	39 28	106 02	1900	14 00	13 56	G. B. Walker
Jefferson County	.. ..	... ..	1865	14 56	13 59	Mean, 5 stations
Garfield County, west	. ..	... ..	1894	15 20	15 03	Mean, 2 stations
Garfield County, east	.. ..	... ..	1890	15 25	14 59	Mean, 4 stations
Eagle County	.. ..	... ..	1890	14 51	14 25	Do.
Summit County	.. ..	... ..	1891	14 30	14 06	Mean, 2 stations
Golden	39 45	105 13	1900.7	14 14	14 11	R. S. Stockton
Clear Creek County	.. ..	... ..	1867	15 02	14 05	Mean, 2 stations
Arapahoe County, east	.. ..	... ..	1871	14 10	13 10	Mean, 14 stations
Arapahoe County, middle	.. ..	... ..	1862	14 30	13 24	Do.
Arapahoe County, west	.. ..	... ..	1860	15 05	13 58	Mean, 11 stations
Gilpin County	.. ..	... ..	1867	15 02	14 05	Mean, 2 stations
East Boundary	39 52	102 03	1872.8	14 05	12 57	J. J. Major
Do.	39 54	102 03	1872.8	14 00	12 52	Do.
Do.	39 57	102 03	1872.8	14 00	12 52	Do.
Do.	39 59	102 03	1872.8	14 10	13 02	Do.
Rio Blanco County, east	.. ..	... ..	1883	15 10	14 33	Mean, 2 stations
Boulder	40 01	105 16	1901.2	14 30	14 28	G. W. Teal
Boulder County	.. ..	... ..	1866	15 06	14 09	Mean, 10 stations
Toponas	40 04	106 48	1895	14 30	14 14	County surveyor
Grand County	.. ..	... ..	1879	15 03	14 21	Mean, 11 stations
Yuma, Meridian Line	40 08	102 41	1901.0	12 58	12 56	Ira Edwards

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

COLORADO—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Yuma, Weld Avenue	40 08	102 41	1901.2	12 00	11 58	Ira Edwards
Yuma County	.. ..	... ..	1866	14 30	13 26	Mean, 6 stations
Washington County	.. ..	... ..	1868	14 40	13 37	Mean, 11 stations
Weld County, southwest	.. ..	... ..	1861	15 05	13 59	Mean, 13 stations
Morgan County	.. ..	... ..	1871	15 05	14 05	Mean, 12 stations
Fort Morgan	40 15	103 47	1900	14 08	14 04	R. F. Walter
Loveland	40 23	105 04	1900	14 15	14 11	Do.
Greeley	40 26	104 41	1900	14 12	14 08	Do.
Phillips County	.. ..	... ..	1872	14 40	13 41	1 station
Routt County, east	.. ..	... ..	1887	15 26	14 55	Mean, 17 stations
Routt County, west	.. ..	... ..	1891	15 18	14 54	1 station
Larimer County, east	.. ..	... ..	1865	15 14	14 17	Mean, 9 stations
Larimer County, west	.. ..	... ..	1877	15 00	14 16	Mean, 2 stations
Logan County	.. ..	... ..	1870	14 46	13 44	Mean, 5 stations
Weld County, northeast	.. ..	... ..	1870	15 30	14 28	1 station
Weld County, northwest	.. ..	... ..	1864	15 10	14 05	Mean, 11 stations
Sedgwick County	.. ..	... ..	1880	14 20	13 31	Mean, 2 stations
Northern Boundary	41 00	105 00	1866.5	15 15	14 11	John Prince

CONNECTICUT

Group I	° ′	° ′		*West* ° ′	*West* ° ′	
Stamford	41 04	73 32	1844.70	6 36.0	9 57	J. Renwick
Round Hill	41 06	73 40	1833.52	5 43	9 48	F. R. Hassler
Norwalk	41 07	73 25	1844.70	6 49.4	10 10	J. Renwick
Black Rock	41 09	73 13	1845.72	6 53.5	10 10	Do.
Bridgeport	41 10	73 11	1845.71	6 19.3	9 36	Do.
Millford	41 14	73 04	1845.72	6 38.3	9 55	Do.
Saybrook	41 16	72 21	1845.63	6 49.9	10 06	Do.
Tashua	41 16	73 15	1863.69	8 02.5	10 04	Dean & Lyman
Sachem's Head	41 17	72 44	1845.64	6 15.2	9 32	J. Renwick
Fort Wooster	41 17	72 54	1848.64	7 25.5	10 30	J. S. Ruth
Oyster Point	41 17	72 56	1855.63	7 02.7	9 38	C. A. Schott
New Haven	41 18	72 55	1895.65	9 36.3	9 51	J. B. Baylor
Groton Point	41 18	72 05	1845.62	7 29.5	10 46	J. Renwick
Stonington	41 20	71 54	1845.60	7 38.1	10 55	Do.
Wooster	41 21	73 29	1864.59	7 37.6	9 36	R. E. Halter
Sandford	41 28	72 57	1862.77	7 01.7	9 07	E. Goodfellow
Westfield	41 34	72 43	1891.73	9 46	10 10	W. C. Hodgkins
Schoolhouse Hill	41 40	72 41	1891.73	9 49	10 13	Do.
Taylor	41 40	72 35	1891.79	9 28	9 52	Do.
Hartford[a]	41 46	72 40	1890.78	9 01.5	9 28	J. B. Baylor
Box Hill	41 48	72 27	1861.79	8 30.4	10 40	Dean & Halter
Ivy	41 52	73 14	1863.58	8 25.7	10 28	Dean & Lyman
Bald Hill	41 58	72 12	1861.71	8 50.4	11 00	Dean & Halter
Group II						
Toilsome Hill	41 12	73 13	1880.5	8 54	9 51	J. P. Bogart
Double Beach	41 14	72 51	1884.55	9 25.8	10 11	O. T. Sherman

[a] Local disturbance.

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

CONNECTICUT—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*West* ° ′	*West* ° ′	
South End	41 14	72 53	1884.55	8 46.2	9 31	O. T. Sherman
Lyme	41 18	72 17	1810.5	4 30	9 45	A. Miller
New Haven	41 18	72 56	1900.7	10 02	10 05	C. A. Wheeler
Danbury	41 22	73 23	1810.5	5 41	10 56	A. Miller
Centerville	41 23	72 54	1884.6	9 06.2	9 51	O. T. Sherman
Middletown	41 34	72 39	1895	10 00	10 15	County surveyor
Hebron	41 38	72 18	1835.5	6 00	9 58	G. Gillet
Vicinity of Hartford	.. ..	.. ..	1891	10 10	10 34	A. W. Rice
Storrs	41 48	72 15	1901.3	10 30	10 31	C. A. Wheeler
Pomfret	41 52	71 57	1810.5	5 05	10 20	A. Miller
Putnam	41 55	71 55	1866	9 30	11 20	Edgar Clark
Above Hartford	41 58	72 38	1875.0	9 13	10 30	T. C. Ellis

DELAWARE

Group I	° ′	° ′		*West* ° ′	*West* ° ′	
Dagsboro	38 33	75 16	1899.49	5 29.8	5 36	J. A. Fleming
Cape Henlopen	38 47	75 05	1885.58	4 59.6	5 50	J. B. Baylor
Pilot Town	38 47	75 10	1846.50	2 42.7	6 07	J. Locke
Lewes Landing	38 49	75 12	1846.50	2 45.0	6 09	Do.
Harrington	38 55	75 35	1899.48	6 05.6	6 12	J. A. Fleming
Dover	39 09	75 31	1897.35	6 18.8	6 32	O. B. French
Bombay Hook	39 22	75 31	1899.48	6 31.8	6 38	J. A. Fleming
Fort Delaware	39 35	75 34	1846.45	3 16.8	6 41	J. Locke
Newark	39 41	75 44	1899.48	5 19.6	5 26	J. A. Fleming
Sawyer	39 42	75 34	1846.42	2 48.3	6 13	J. Locke
Wilmington	39 47	75 32	1875.55	3 44.4	5 13	J. M. Poole
Group II						
Delaware City	39 35	75 36	1842.50	3 30	7 09	Barnett

DISTRICT OF COLUMBIA

Group I	° ′	° ′		*E. or W.* ° ′	*West* ° ′	
Washington C. & G. S. Office station	38 53	77 00	1901.5	5 07.5 W	5 09	Various
Causten, Georgetown Hts.	38 56	77 04	1855.77	1 04.0 W	3 58	C. A. Schott
Group II						
Washington Naval Observatory, old site	38 54	77 03	1892.50	4 14.2 W	4 45	
Washington Naval Observatory, new site	38 55	77 04	1894.50	3 40.0 W	4 04	

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

DISTRICT OF COLUMBIA—Continued

	Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
	Group II—Continued	° ′	° ′		*E. or W.* ° ′	*West* ° ′	
Boundary stones of the District of Columbia.	SE. side m. s. 9	38 48	77 02	1792.0	0 37 E	4 03	A. Ellicott
	SW. " " 1	38 48	77 03	"	0 30 W	5 10	Do.
	SE. " " 8	38 49	77 01	"	0 34 E	4 06	Do.
	SE. " " 7	38 49	77 00	"	0 25 E	4 15	Do.
	SE. " " 6	38.50	76 59	"	0 18 E	4 22	Do.
	SE. " " 5	38 50	76 59	"	0 21 E	4 19	Do.
	SE. " " 3	38 52	76 57	"	0 08 W	4 48	Do.
	SW. " " 7	38 52	77 08	"	0 05 E	4 35	Do.
	SE. " " 2	38 52	76 56	"	0 04 E	4 36	Do.
	East corner	38 53	76 55	"	0 10 E	4 30	Do.
	NE. side m. s. 9	38 54	76 55	"	0 19 E	4 21	Do.
	NE. " " 8	38 55	76 56	"	0 24 E	4 16	Do.
	NE. " " 7	38 55	76 57	"	1 08 E	3 32	Do.
	NW. " " 2	38 55	77 09	"	0 35 E	4 05	Do.
	NW. " " 3	38 55	77 08	"	0 10 E	4 30	Do.
	NW. " " 4	38 56	77 07	"	0 03 W	4 43	Do.
	NE. " " 6	38 56	76 58	"	0 51 E	3 49	Do.
	NE. " " 5	38 57	76 59	"	0 22 E	4 18	Do.
	NE. " " 4	38 57	76 59	"	0 25 W	5 05	Do.
	NW. " " 5	38 57	77 06	"	0 45 W	5 25	Do.
	NW. " " 7	38 58	77 05	"	0 59 E	3 41	Do.
	NE. " " 3	38 58	77 00	"	0 18 W	4 58	Do.
	NE. " " 2	38 59	77 01	"	1 12 E	3 28	Do.
	NE. " " 1	38 59	77 02	"	1 06 E	3 34	Do.
	NW. " " 8	38 59	77 04	"	0 29 E	4 11	Do.
	NW. " " 9	38 59	77 03	"	2 00 E	2 40	Do.
	North corner	39 00	77 02	"	1 25 E	3 15	Do.

FLORIDA

Group I	° ′	° ′		*East* ° ′	*East* ° ′	
Sand Key	24 27	81 53	1849.64	5 28.8	2 35	J. E. Hilgard
Key West	24 33	81 48	1896.12	2 49.2	2 32	G. R. Putnam
Bird Key, Dry Tortugas	24 37	82 54	1880.04	3 42.6	2 35	S. M. Ackley
Cape Sable Base	25 08	81 02	1855.4	5 23	2 49	A. D. Bache
Cape Florida, Key Biscayne	25 40	80 10	1850.15	4 25.2	1 34	J. E. Hilgard
Hills	26 16	80 05	1884.06	2 43.1	1 48	B. A. Colonna
Punta Rasa	26 29	82 01	1866.49	4 01.5	2 06	A. T. Mosman
Spencer	26 44	80 02	1884.21	2 51.6	1 58	B. A. Colonna
Fort Jupiter	26 54	80 05	1880.18	2 50.7	1 43	J. B. Baylor
House of Refuge, No. 2	27 12	80 10	1883.04	2 35.9	1 38	B. A. Colonna
Bell	27 28	80 20	1883.34	2 12.1	1 15	Do.
St. Lucie, Fort Capron	27 29	80 15	1880.17	2 24.9	1 18	J. B. Baylor
Tampa	27 57	82 27	1887.08	3 01.6	2 12	Do.
Turkey Creek	28 04	80 35	1878.38	3 09.1	1 44	R. M. Bache
Eau Gallie	28 09	80 37	1880.15	1 59.8	0 41	J. B. Baylor
Enterprise	28 53	81 14	1880.13	2 46.1	1 27	Do.
Cedar Keys	29 08	83 02	1900.35	2 34.2	2 28	D. L. Hazard
Cape St. George	29 37	85 06	1853.26	6 02.1	3 17	J. G. Oltmanns
Palatka	29 38	81 38	1900.33	1 11.5	1 06	D. L. Hazard
Gainesville	29 39	82 19	1900.34	2 14.4	2 09	Do.

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

FLORIDA—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group I—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Cape San Blas	29 40	85 22	1854.08	6 06.5	3 24	J. G. Oltmanns
Apalachicola	29 43	84 59	1860.09	6 12.0	3 45	G. W. Dean
Dog Island Light	29 47	84 40	1853.25	5 51.2	3 02	J. G. Oltmanns
St. Augustine	29 54	81 19	1900.32	1 22.2	1 17	D. L. Hazard
St. Marks Light	30 04	84 11	1852.25	5 29.2	2 37	J. E. Hilgard
Hurricane Island	30 04	85 39	1854.10	6 12.2	3 30	J. G. Oltmanns
Perry	30 06	83 35	1900.36	2 19.7	2 14	D. L. Hazard
Lake City	30 11	82 38	1900.30	1 31.5	1 26	Do.
Baldwin	30 18	81 58	1900.30	2 04.1	1 58	Do.
Jacksonville	30 20	81 39	1900.31	1 15.6	1 10	Do.
Pensacola, Navy-Yard	30 21	87 16	1900.39	4 25.7	4 20	Do.
Pensacola	30 25	87 12	1861.02	6 42.2	4 18	G. W. Dean
Tallahassee	30 26	84 18	1900.37	2 19.8	2 14	D. L. Hazard
Sand String	30 27	87 06	1894.29	4 50.7	4 24	H. L. Stidham
Pond	30 27	86 56	1894.24	4 22.0	3 54	Do.
Mill Point	30 28	86 56	1894.23	4 26.5	3 59	Do.
Madison	30 29	83 25	1900.29	2 27.4	2 22	D. L. Hazard
Devil Point	30 30	87 09	1894.31	4 56.0	4 28	H. L. Stidham
Lindsay	30 30	87 03	1894.27	4 43.6	4 16	Do.
Shield Point	30 35	87 01	1893.14	4 37.2	4 06	P. A. Welker
Fernandina	30 40	81 27	1900.32	1 19.6	1 14	D. L. Hazard
De Funiak Springs	30 43	86 07	1900.38	3 36.4	3 31	Do.
Marianna	30 47	85 13	1900.37	3 41.3	3 36	Do.
Group II						
Florida, reef off west end	24 15	82 40	1818.5	6 33	2 25	Livingston
Florida, reef off Bahia Honda	24 30	81 15	1833	6 07	2 29	British Admiralty
Monroe County	.. ..	.. ..	1885	3 20	2 30	Mean, 6 stations
Dade County	.. ..	.. ..	1870	3 20	1 39	Mean, 5 stations
Gasparilla Island Light	26 43	82 16	1891.0	3 07	2 35	J. L. Brownlee
De Soto County	.. ..	.. ..	1850	4 18	1 28	Mean, 3 stations
Manatee County	.. ..	.. ..	1843	4 45	1 33	1 station
Braidentown	27 30	82 35	1901.4	1 57	1 55	E. B. Camp
Egmont Key, Tampa Bay	27 36	82 46	1843.5	5 25	2 13	L. M. Powell
Hillsboro County	.. ..	.. ..	1845	4 35	1 30	Mean, 10 stations
Do.	.. ..	.. ..	1901.2	2 20	2 17	T. J. Beaty, jr.
Bartow	27 54	81 50	1901.0	1 38	1 35	H. T. Battaile
Polk County	.. ..	.. ..	1850	4 40	1 37	Mean, 9 stations
Brevard County	.. ..	.. ..	1870	3 00	1 05	Mean, 12 stations
Osceola County	.. ..	.. ..	1858	3 45	1 07	Mean, 4 stations
Kissimmee	28 18	81 24	1891	2 30	1 53	County surveyor
Pasco County	.. ..	.. ..	1846	4 22	1 04	Mean, 6 stations
Hernando County	.. ..	.. ..	1843	4 50	1 29	Mean, 9 stations
Brooksville	28 32	82 22	1901.0	1 57	1 54	John F. Hall
Orlando	28 32	81 22	1893	2 27	1 57	J. O. Fries
Orange County	.. ..	.. ..	1865	3 43	1 30	Mean, 9 stations
Titusville	28 36	80 48	1879.7	2 05	0 44	J. F. Le Baron
Sumter County	.. ..	.. ..	1845	4 30	1 14	Mean, 17 stations
Lake County	.. ..	.. ..	1843	4 20	0 59	Mean, 5 stations
Citrus County	.. ..	.. ..	1855	4 06	1 19	Mean, 4 stations
Inverness	28 50	82 19	1894	2 35	2 09	G. T. Hampton
Volusia County	.. ..	.. ..	1850	4 10	1 07	Mean, 8 stations
Daytona	29 08	80 58	1876.2	3 14.5	1 40	D. D. Rogers
Ocala	29 11	82 08	1890	2 26	1 46	County surveyor

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued

FLORIDA—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Marion County	.. ..	.. ..	1842	4 38	1 14	Mean, 14 stations
Levy County	.. ..	.. ..	1863	4 08	1 48	Mean, 4 stations
Orange Springs	29 30	81 57	1835.5	5 25	1 45	P. J. Latham
Putman County	.. ..	.. ..	1834	5 28	1 46	Mean, 2 stations
Alachua County	.. ..	.. ..	1835	5 18	1 38	Mean, 8 stations
Lafayette County	.. ..	.. ..	1831	6 10	2 22	1 station
St. Joseph Bay Light	29 52	85 23	1843.5	6 24	3 17	L. M. Powell
Starke	29 56	82 06	1901.2	2 18	2 15	H. E. Lagergren
Bradford County	.. ..	.. ..	1850	5 30	2 27	Mean, 5 stations
St. Marks	30 08	84 11	1875.4	4 30.3	2 54	J. M. Poole
Wakulla County	.. ..	.. ..	1881	4 05	2 50	Mean, 2 stations
Calhoun County	.. ..	.. ..	1881	4 55	3 40	Do.
Columbia County	.. ..	.. ..	1881	3 00	1 45	1 station
Suwanee County	.. ..	.. ..	1863	4 15	1 55	Mean, 2 stations
Liveoak	30 17	82 59	1895	2 30	2 07	County surveyor
Liberty County	.. ..	.. ..	1895	3 30	3 07	1 station
Baker County	.. ..	.. ..	1837	5 52	2 17	Mean, 4 stations
Duval County	.. ..	.. ..	1881	2 20	1 05	Mean, 3 stations
Jefferson County	.. ..	.. ..	1825	6 10	2 30	1 station
Washington County	.. ..	.. ..	1881	4 50	3 35	Do.
Madison County	.. ..	.. ..	1866	4 05	1 55	Mean, 3 stations
Hamilton County	.. ..	.. ..	1891	3 10	2 33	Mean, 2 stations
Jasper	30 30	82 57	1895	2 38	2 15	County surveyor
Amelia Island Light	30 40	81 26	1889.5	1 57	1 13	W. P. Paret

GEORGIA

Group I	° ′	° ′		*East* ° ′	*East* ° ′	
Thomasville	30 50	83 59	1900.28	2 20.0	2 14	D. L. Hazard
Dupont or Lawton	30 58	82 55	1880.08	2 26.0	1 06	J. B. Baylor
Pelham	31 07	84 09	1900.27	2 26.6	2 21	D. L. Hazard
Brunswick	31 09	81 30	1887.15	1 48.5	0 56	J. B. Baylor
Waycross	31 11	82 22	1887.14	2 01.5	1 09	Do.
Butler, St. Simons Island	31 18	81 21	1872.20	2 42.9	0 54	A. T. Mosman
Cedar Point	31 30	81 21	1902.05	0 54.0	0 54	O. B. French
Albany	31 34	84 08	1900.27	2 03.6	1 58	D. L. Hazard
Jesup	31 36	81 55	1887.17	1 44.8	0 52	J. B. Baylor
Skiddaway N. Base	31 56	81 02	1856.30	3 25.0	0 40	A. W. Longfellow
Tybee Light	32 02	80 51	1870.38	2 20.5	0 25	C. O. Boutelle
Savannah, Hutchinsons I.	32 05	81 05	1895.41	0 57.2	0 34	J. B. Baylor
Oglethorpe	32 17	84 04	1900.26	2 10.2	2 04	D. L. Hazard
Macon	32 49	83 37	1900.25	1 56.5	1 50	Do.
Milledgeville	33 04	83 16	1900.24	2 40.4	2 36	Do.
Warrenton	33 23	82 40	1900.24	1 14.1	1 08	Do.
Augusta	33 28	81 57	1900.23	0 42.9	0 37	Do.
Atlanta	33 44	84 22	1896.29	1 51.1	1 32	G. R. Putnam
Atlanta Base (P. T. Ridge)	33 54	84 17	1873.12	3 34.9	1 49	F. P. Webber
Lawrenceville	33 58	84 00	1874.94	3 24.8	1 46	C. O. Boutelle
Kenesaw	33 59	84 35	1873.58	4 43.4	3 00	F. P. Webber
Carnes	34 00	85 01	1873.97	4 05.5	2 24	Do.
Sweat	34 04	84 27	1873.77	5 36.9	3 54	Do.
Cumming	34 12	84 08	1873.86	3 13.5	1 31	H. W. Blair

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

GEORGIA—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group I—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Sawnee	34 14	84 10	1873.83	2 55.0	1 12	C. O. Boutelle
Rome	34 15	85 08	1896.27	2 17.5	1 57	J. B. Baylor
Pine Log	34 19	84 38	1874.61	4 00.0	2 21	F. P. Webber
Lavender	34 19	85 17	1874.95	3 58.9	2 20	Do.
Grassy	34 29	84 20	1874.56	3 36.0	1 57	C. O. Boutelle
Skitt	34 30	83 43	1874.63	2 35.5	0 56	Do.
Currahee	34 32	83 23	1874.80	2 47.9	1 09	Do.
Johns	34 37	85 06	1875.47	3 57.1	2 20	F. P. Webber
Group II						
Folkston	30 48	82 01	1900	1 15	1 10	J. R. Cooper
Bainbridge	30 55	84 36	1839.5	5 30	1 59	State Geol. Surv.
Owens Ferry	30 56	81 51	1895	1 15	0 52	J. H. King, jr.
Dupont	31 00	82 53	1901	1 00	0 58	J. B. Coon
Colquitt County	.. ..	.. ..	1895	1 45	1 22	County surveyor
Mimsville	31 15	84 34	1895	1 30	1 07	Do.
Darien	31 26	81 26	1838.5	5 05	1 32	State Geol. Surv.
Fort Gaines	31 38	85 09	1839.5	5 31	2 00	Do.
Hinesville	31 48	81 37	1838.5	5 05	1 32	Do.
Cuthbert	31 49	84 48	1839.5	5 30	1 59	Do.
Lumber City	31 57	82 45	1875.5	3 10.8	1 34	J. M. Poole
Clyde	32 02	81 24	1838.5	5 05	1 32	State Geol. Surv.
Lumpkin	32 02	84 48	1839.5	5 27	1 56	Do.
Sumter County	.. ..	.. ..	1901	1 15	1 13	D. P. Holt
Dooly County	.. ..	.. ..	1895	1 45	1 22	County surveyor
Beards Creek	.. ..	.. ..	1838	5 23	1 50	State Geol. Surv.
Cottage Green	.. ..	.. ..	1837	5 05	1 30	Do.
Ashville	.. ..	.. ..	1837	5 05	1 30	Do.
Oak Level	.. ..	.. ..	1837	5 05	1 30	Do.
Springfield	32 18	81 19	1837.5	5 05	1 30	Do.
Perry	32 27	83 44	1901	1 45	1 43	G. W. Killen
Columbus	32 27	84 59	1895	2 30	2 07	County surveyor
Black Creek	32 39	81 28	1837.5	5 04	1 29	State Geol. Surv.
Swainsboro	32 39	82 30	1838.5	5 04	1 31	Do.
Talbot County	.. ..	.. ..	1895	2 00	1 37	County surveyor
Johnson County	.. ..	.. ..	1895	3 00	2 37	Do.
Knoxville	32 43	84 00	1895	2 15	1 52	Do.
Birdsville	32 48	82 13	1837.5	5 01	1 26	State Geol. Surv.
Jacksonboro	32 49	81 43	1837.5	4 55	1 20	Do.
Millen	32 46	81 57	1875.5	2 37.3	1 00	J. M. Poole
Mill Haven	32 56	81 47	1837.5	5 04	1 29	State Geol. Surv.
Sandersville	32 57	82 50	1838.5	5 27	1 54	Do.
Jones County	.. ..	.. ..	1901	1 45	1 43	S. L. Chiles
Monroe County	.. ..	.. ..	1895	1 15	0 52	County surveyor
Lagrange	33 01	85 01	1895	2 30	2 07	Roy Dallas
Waynesboro	33 03	82 00	1837.5	5 04	1 29	State Geol. Surv.
Butts County	.. ..	.. ..	1900	1 25	1 20	J. C. Maddux
Griffin	33 15	84 16	1895	1 36	1 13	M. F. Tutuilla
Eatonton	33 21	83 23	1838.5	4 32	0 59	State Geol. Surv.
Fayetteville	33 26	84 27	1901	1 30	1 28	R. H. Bennett
Clayton County	.. ..	.. ..	1893	2 00	1 30	W. J. Lee
Appling	33 32	82 19	1837.5	5 00	1 25	State Geol. Surv.
Madison	33 34	83 40	1838.5	4 29	0 56	Do.
Campbell County	.. ..	.. ..	1895	1 30	1 07	County surveyor
Washington	33 44	82 42	1900.4	1 08	1 02	Professor Bartlett
Walton County	.. ..	.. ..	1901	1 30	1 28	C. M. Boot

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

GEORGIA—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Lincolnton	33 46	82 29	1837.5	5 09	1 34	State Geol. Surv.
Buchanan	33 48	85 12	1900	2 00	1 55	J. S. Dean
Monroe	33 51	83 43	1838.5	5 10	1 37	State Geol. Surv.
Goshen	33 52	82 33	1837.5	5 09	1 34	Do.
Athens	33 56	83 26	1896	1 42	1 23	County surveyor
Cobb County	.. ..	.. ..	1901	1 06	1 04	F. B. Barber
Milton County	.. ..	.. ..	1901	2 15	2 13	R. C. Nesbit
Elberton	34 06	82 52	1837.5	4 33	0 58	State Geol. Surv.
Stilesboro	34 07	84 56	1895	2 30	2 07	H. J. McCormick
Rome	34 15	85 08	1900.7	1 18	1 14	J. T. Moore
Homer	34 19	83 31	1895	1 30	1 07	County surveyor
Carnesville	34 22	83 14	1837.5	5 01	1 26	State Geol. Surv.
Dahlonega	34 35	83 58	1898	1 45	1 33	C. J. Norwood
Toccoa Falls	34 36	83 20	1837.5	5 00	1 25	State Geol. Surv.
Cleveland	34 37	83 47	1895	1 15	0 52	County surveyor
Gilmer County	.. ..	.. ..	1896	2 00	1 41	M. S. Clayton
Chickamauga	34 52	85 18	1893	2 02	1 32	County surveyor
Morganton	34 53	84 14	1895	2 30	2 07	C. G. Baugh
Towns County	.. ..	.. ..	1901	1 45	1 43	R. G. Sutton

HAWAIIAN ISLANDS

Group I	° ′	° ′		*East* ° ′	*East* ° ′	
Kilauea, Hawaii	19 25	155 16	1900.87	9 00.7	9 02	L. A. Bauer
Napoopoo, Hawaii	19 29	155 59	1892.63	9 08.1	9 23	E. D. Preston
Kalaieha, Hawaii	19 43	155 26	1892.53	9 52.6	10 07	Do.
Hilo, Hawaii	19 44	155 04	1900.04	8 43.8	8 47	E. R. Frisby
Waiau, Hawaii	19 49	155 27	1892.56	10 22.7	10 37	E. D. Preston
Waimea, Hawaii	20 02	155 38	1892.52	9 05.7	9 20	Do.
Kawaihae, Hawaii	20 02	155 48	1892.50	9 20.6	9 35	Do.
Lahaina, Maui	20 52	156 41	1900.10	9 24.8	9 28	E. R. Frisby
Kahului, Maui	20 54	156 28	1899.96	8 57.3	9 00	Do.
Waikiki, Oahu	21 16	157 50	1891.61	10 05.2	10 21	E. D. Preston
Honolulu, Oahu	21 18	157 52	1900.88	10 23.9	10 26	L. A. Bauer
Sisal A, Oahu	21 19	158 04	1900.87	9 18.5	9 20	Do.
Sisal B, Oahu	21 19	158 04	1900.88	9 16.6	9 18	Do.
Honolulu Mag. Obs'y, Oahu	21 19	158 04	1902.00	9 17.5	9 18	J. A. Fleming
Puuloa Point, Oahu	21 19	157 58	1900.89	10 04.2	10 06	L. A. Bauer
Puuloa R. R. station, Oahu	21 20	157 56	1900.89	10 09.7	10 11	Do.
Honouliuli Ranch, Oahu	21 20	158 02	1900.86	10 25.9	10 28	Do.
Kahuku, Oahu	21 43	157 59	1900.83	10 25.0	10 27	Do.
Nonopapa, Niihau	21 55	160 13	1892.69	10 01.4	10 16	E. D. Preston
Waimea Bay, Kauai	21 57	159 42	1892.68	9 46.3	10 00	Do.

IDAHO

Group I	° ′	° ′		*East* ° ′	*East* ° ′	
Lewiston	46 28	117 05	1881.71	21 26.2	21 16	J. S. Lawson
Lake Pend d'Oreille	47 58	116 30	1881.70	22 05.4	21 55	Do.
Siniaquoteen	48 10	116 45	1881.67	22 28.5	22 18	Do.

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

IDAHO—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II	° ′	° ′		*East* ° ′	*East* ° ′	
Utah Boundary	42 00	111 07	1871.7	17 30	17 06	D. G. Major
Do.	42 00	111 16	1871.7	17 30	17 06	Do.
Do.	42 00	111 35	1871.7	17 55	17 31	Do.
Do.	42 00	111 49	1871.7	17 41	17 17	Do.
Do.	42 00	112 02	1871.7	17 50	17 26	Do.
St. Charles Canyon	42 05	111 32	1877.5	18 08	17 50	S. E. Tillman
Oregon Boundary	42 06	117 03	1867.9	18 31	18 38	D. G. Major
Robbins Ford	42 10	111 49	1877.5	17 48	17 30	S. E. Tillman
Oneida County, east	.. ..	... ..	1872	18 00	17 45	Mean, 3 stations
Malade City	42 11	112 16	1877.5	17 44	17 26	R. Birnie
Bear River	42 13	111 08	1877.5	17 59.5	17 42	S. E. Tillman
Mink Creek	42 13	111 44	1877.5	17 51	17 33	Do.
Camp 80, S. of Oxford set.	42 14	112 01	1877.5	18 21	18 03	W. Young
Cassia County, east	.. ..	... ..	1881	17 48	17 34	Mean, 14 stations
Cassia County, west	.. ..	... ..	1889	17 48	17 36	Mean, 18 stations
Oneida County, southwest	.. ..	... ..	1873	17 55	17 39	Mean, 3 stations
Camp 77, NW. of Oxford Pk.	42 16	112 05	1877.5	17 50	17 32	W. Young
Bear Lake County	.. ..	... ..	1879	17 58	17 39	Mean, 6 stations
Oregon Boundary	42 21	117 03	1867.9	18 30	18 37	D. G. Major
Camp 78, NE. of Elkhorn Pk.	42 23	112 13	1877.5	17 51	17 33	W. Young
Camp 53, southeast of Mount Sedgewick	42 28	111 47	1877.5	18 18	18 00	S. E. Tillman
Owyhee County, east	.. ..	... ..	1877	18 27	18 19	Mean, 10 stations
Boise Meridian, mean, 6 sta.	42 30	116 22	1867.5	18 45	18 47	L. F. Cartee
Owyhee County, southwest	.. ..	... ..	1879	18 48	18 38	Mean, 7 stations
Hawkins Creek	42 32	112 20	1877.5	22 47	22 29	W. Young
Oregon Boundary	42 35	117 03	1867.9	18 32	18 39	D. G. Major
Raft Creek	42 36	113 14	1859.6	16 45	16 43	J. Dixon
Camp 71	42 38	112 23	1877.5	18 37	18 19	W. Young
Soda Springs Village	42 40	111 35	1877.5	21 10	20 52	S. E. Tillman
Oneida County, northwest	.. ..	... ..	1878	17 52	17 33	Mean, 3 stations
Salmon River Falls	42 42	114 39	1859.6	17 11	17 09	J. Dixon
Shadow Lake	42 43	113 05	1877.5	16 04	15 46	R. Birnie
Bannock Connty, east	.. ..	... ..	1880	17 45	17 26	Mean, 14 stations
Bannock County, west	.. ..	... ..	1890	17 40	17 26	Mean, 10 stations
Oregon Boundary	42 45	117 03	1867.9	18 18	18 25	D. G. Major
Game Creek	42 46	111 15	1877.5	18 19	18 01	S. E. Tillman
Smoky Creek	42 47	111 04	1877.5	18 25	18 07	Do.
Magnetic Station	42 47	111 57	1889.4	18 03	17 48	N. P. Anderson
Port Neuf River	42 47	112 16	1877.5	18 44	18 26	S. E. Tillman
Shoshone	42 54	114 21	1900	18 30	18 28	J. W. Waldron
Lanes Fork	42 55	111 18	1877.5	18 26	18 08	S. E. Tillman
Rattlesnake Meadows	42 56	115 06	1859.6	17 00	17 06	J. Dixon
Little Blackfoot River	42 57	111 30	1877.5	18 52	18 34	S. E. Tillman
Silver City	42 57	116 43	1900.8	19 12	19 11	F. W. Hulett
Tincup Run	42 59	111 16	1877.5	18 32	18 14	S. E. Tillman
Lincoln County, east	.. ..	... ..	1888	17 55	17 43	Mean, 15 stations
Lincoln County, west	.. ..	... ..	1880	18 42	18 28	Mean, 10 stations
Owyhee County, NW.	.. ..	... ..	1882	18 47	18 37	Mean, 12 stations
Oregon Boundary	43 00	117 03	1867.9	18 23	18 30	D. G. Major
Jack Knife Creek	43 02	111 07	1877.5	18 27	18 09	S. E. Tillman
Camp 41, NE. of Mt. Pisgah	43 07	111 15	1877.5	18 20	18 02	Do.
Fort Hall	43 09	112 12	1877.5	18 13	17 55	R. Birnie

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

IDAHO—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Camp 43	43 10	111 48	1877.5	18 43	18 25	S. E. Tillman
Highane Ranch	43 14	112 26	1872.8	17 50	17 34	F. V. Hayden
Elmore County, south	.. ..	... ..	1887	18 58	18 48	Mean, 9 stations
Oregon Boundary	43 15	117 03	1867.8	18 22	18 29	D. G. Major
Bingham County, east	.. ..	... ..	1890	18 13	18 00	Mean, 4 stations
Bingham County, west	.. ..	... ..	1892	17 46	17 35	Mean, 6 stations
Base Line, mean of 6 stations	43 22	114 17	1867.5	18 45	18 40	L. F. Cartee
Base Line, mean of 5 stations	43 22	116 30	1867.5	18 27	18 29	Do.
Hot Springs	43 23	116 18	1959.6	17 50	18 04	J. Dixon
Boise Meridian, mean, 5 sta.	43 25	116 22	1867.5	18 15	18 17	L. F. Cartee
Ada County	.. ..	... ..	1885	18 47	18 37	Mean, 20 stations
Oregon Boundary	43 33	117 03	1867.8	18 49	18 56	D. G. Major
Willow Creek	43 34	111 42	1872.8	17 55	17 40	F. V. Hayden
Camp 52	43 35?	111 30?	1872.8	18 00	17 45	Do.
Blaine County, east	.. ..	... ..	1891	19 10	18 59	Mean, 12 stations
Blaine County, west	.. ..	... ..	1885	18 35	18 22	Mean, 3 stations
Boise	43 37	116 12	1895	18 45	18 38	County surveyor
Snake River, 8 miles below Canyon	43 40	111 20	1872.8	17 59	17 44	F. V. Hayden
Caldwell	43 40	116 41	1893	19 00	18 52	County surveyor
Oregon Boundary	43 44	117 03	1867.8	19 03	19 11	D. G. Major
Elmore County, north	.. ..	... ..	1874	18 45	18 39	One station
Canyon County	.. ..	... ..	1880	18 30	18 20	Mean, 4 stations
Fremont County, east	.. ..	... ..	1891	18 15	18 02	Mean, 18 stations
Fremont County, west	.. ..	... ..	1877	18 30	18 12	One station
Boise County, south	.. ..	... ..	1885	19 03	18 53	Mean, 18 stations
Camp 16, mouth of Fall R.	44 01	111 30	1872.6	18 12	17 57	F. V. Hayden
Boise Meridian, mean, 4 sta.	44 10	116 22	1867.5	19 07.5	19 10	L. F. Cartee
Weiser	44 14	116 53	1901.2	21.00	20 59	C. W. Lucks
Custer County, east	.. ..	... ..	1891	19 03	18 52	Mean, 29 stations
Custer County, west	.. ..	... ..	1893	19 00	18 51	One station
Henrys Fork	44 19	111 20?	1872.6	18 25	18 10	F. V. Hayden
Washington County, south	.. ..	... ..	1876	18 53	18 46	Mean, 10 stations
Camp 26	44 30?	111 20?	1872.6	19 13	18 58	F. V. Hayden
Boise County, north	.. ..	... ..	1890	19 30	19 20	Mean, 5 stations
Lemhi County, southeast	.. ..	... ..	1892	19 10	18 59	Mean, 3 stations
Camp 27, Henry Lake Valley	44 38	111 17	1872.6	18 44	18 29	F. V. Hayden
Boise Meridian, mean, 3 sta.	44 45	116 22	1867.5	19 10	19 12	L. F. Cartee
Washington County, north	.. ..	... ..	1891	19 07	18 58	Mean, 4 stations
Boise Meridian, mean, 3 sta.	45 14	116 22	1867.5	21 10	21 12	L. F. Cartee
Lemhi County, northwest	.. ..	... ..	1889	19 30	19 18	Mean, 7 stations
Idaho County, west	.. ..	... ..	1884	20 42	20 32	Mean, 9 stations
Boise Meridian, mean, 4 sta.	45 44	116 22	1867.5	20 56.2	20 58	L. F. Cartee
Idaho County, northeast	.. ..	... ..	1890	20 50	20 40	Mean, 4 stations
Nez Perces County	.. ..	... ..	1885	20 52	20 42	Mean, 23 stations
Boise Meridian, mean, 4 sta.	46 17	116 22	1867.5	20 18.8	20 21	L. F. Cartee
Fort Lapway	46 18	116 54	1876.4	19 45	19 38	W. M. Miller
Moscow	46 44	117 00	1893	21 30	21 23	County surveyor
Shoshone County, south	.. ..	... ..	1892	21 12	21 04	Mean, 5 stations
Latah County	.. ..	... ..	1887	21 07	20 57	Mean, 8 stations
Wallace	47 25	115 56	1894	21 50	21 43	County surveyor
Sahon Pass	47 27	115 43	1860.5	20 37	20 49	J. Mullan
Shoshone County, north	.. ..	... ..	1891	21 30	21 21	Mean, 3 stations
Kootenai County, south	.. ..	... ..	1889	21 30	21 20	Mean, 22 stations

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

IDAHO—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		East ° ′	East ° ′	
Murray	47 32	115 56	1894	21 20	21 13	County surveyor
Coeur d'Alene Mission	47 33	116 21	1860. 5	20 54	21 06	J. Mullan
Washington Boundary	47 54	117 03	1875. 7	22 15	22 13	Reeves & Denison
Do.	48 12	117 03	1875. 7	24 00	23 58	Do.
Pack River	48 22	116 28	1861. 5	22 51	23 02	R. W. Haig
Washington Boundary	48 23	117 03	1875. 7	22 45	22 43	Reeves & Denison
Kootenai County, north	.. ..	... ..	1893	22 15	22 08	Mean, 4 stations
Washington Boundary	48 39	117 03	1875. 8	22 40	22 38	Reeves & Denison
Chelemta River	48 41	116 19	1861. 5	22 11	22 22	R. W. Haig
Washington Boundary	48 47	117 03	1875. 8	23 00	22 58	Reeves & Denison
Boundary Station	49 00	116 33	1860. 0	22 37	22 50	J. S. Harris

ILLINOIS

Group I	° ′	° ′		East ° ′	East ° ′	
Cairo	37 01	89 10	1877. 91	6 00. 4	4 24	A. Braid
Mound City	37 05	89 04	1865. 01	7 32	5 10	A. T. Mosman
McLeansboro	38 06	88 32	1900. 93	4 06. 8	4 03	W. F. Wallis
Nashville	38 20	89 22	1900. 92	4 24. 2	4 20	Do.
Sandoval	38 37	89 09	1896. 34	4 48. 8	4 26	R. L. Faris
Springfield	39 50	89 39	1891. 75	4 46. 7	4 05	J. B. Baylor
Danville	40 07	87 35	1900. 83	2 38. 8	2 34	O. B. French
Bloomington	40 31	88 59	1891. 74	4 00. 4	3 19	J. B. Baylor
Ottawa	41 20	88 50	1891. 73	5 02. 5	4 21	Do.
Chicago, old university site	41 50	87 37	1888. 63	4 07. 4	3 07	Do.
Chicago, near water tower	41 54	87 37	1891. 55	3 32. 3	2 45	G. R. Putnam
Chicago, Lincoln Park	41 56	87 37	1900. 86	3 57. 8	3 53	W. G. Cady
Rockford	42 17	89 06	1891. 71	3 59. 9	3 14	J. B. Baylor
Group II						
America	37 10	89 08	1896	4 45	4 22	J. P. Mathis
Golconda	37 23	88 25	1872. 5	6 05. 8	4 09	T. C. Hilgard
Vienna	37 25	88 54	1885	4 40	3 33	County surveyor
Hardin County	.. ..	.. ..	1895	4 10	3 44	W. H. Scroggins
Gallatin County	37 44	88 19	1901. 2	3 37	3 34	Victor Pearce
Murphysboro	37 47	89 21	1901. 3	5 20	5 17	W. F. Hughes
Chester	37 55	89 51	1895	4 48	4 22	County surveyor
Kaskaskia	37 57	89 55	1809. 5	7 20	4 21	Public surveys
New Athens	38 19	89 55	1880. 8	5 49. 1	4 23	F. E. Nipher
Waterloo	38 20	90 11	1895	5 05	4 39	County surveyor
Jefferson County	.. ..	.. ..	1895	4 00	3 34	W. F. Williams
Wayne County	.. ..	.. .	1818	7 51	4 38	Mean, 5 stations
Edwards County	.. ..	.. ..	1819	7 50	4 36	Mean, 2 stations
Belleville	38 31	90 00	1895	5 20	4 54	County surveyor
Cahokia	38 36	90 09	1810. 5	8 25	5 24	J. Mansfield
Marion County	.. ..	.. ..	1900	4 15	4 09	A. Hamilton
Collinsville	38 39	90 04	1880. 4	6 30. 4	5 03	F. E. Nipher
Olney	38 45	88 07	1895	4 00	3 34	G. W. Armsey
Richland County	.. ..	.. ..	1821	7 40	4 24	Mean, 10 stations
Lawrence County	.. ..	.. ..	1805	6 10	3 20	Mean, 5 stations

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

ILLINOIS—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Clay County	.. ..	.. ..	1817	7 50	4 39	Mean, 6 stations
Highland	38 45	89 41	1872.7	6 34.2	4 38	T. C. Hilgard
East Base	38 52	88 02	1879.8	5 00	3 30	J. H. Darling
Alton	38 52	90 12	1840.5	7 45	4 30	H. Loomis
Greenville	38 54	89 26	1895	5 20	4 54	R. K. Dewey
Vandalia	38 58	89 08	1895	4 45	4 19	A. H. Wing
Fayette County	.. ..	.. ..	1823	8 00	4 43	Mean, 2 stations
Crawford County	.. ..	.. ..	1828	7 30	4 11	Mean, 5 stations
Jasper County	.. ..	.. ..	1820	8 03	4 48	Mean, 21 stations
Effingham	39 08	88 34	1901	4 00	3 57	J. B. Jones
Effingham County	.. ..	.. ..	1820	7 50	4 35	Mean, 3 stations
Bellair	39 11	87 52	1879.8	5 08	3 38	J. H. Darling
Montgomery County	.. ..	.. ..	1823	8 00	4 43	1 station
Cumberland County	.. ..	.. ..	1820	8 26	5 11	Mean, 11 stations
Greene County	.. ..	.. ..	1901	4 45	4 42	T. G. Capps
Coles County	.. ..	.. ..	1821	8 30	5 14	Mean, 11 stations
Sangamon County	39 36	89 45	1890.2	5 33	4 45	Allen Enos
Winchester	39 37	90 29	1892	6 12	5 33	County surveyor
Barry	39 41	91 03	1895	5 00	4 34	A.G. Chamberlain
Edgar County	.. ..	.. ..	1821	8 20	5 04	Mean, 15 stations
Macon	39 42	89 01	1872.7	5 21.5	3 26	T. C. Hilgard
Jacksonville	39 45	90 18	1833.5	8 45	5 27	Sturtevant
Douglas County	.. ..	.. ..	1825	8 03	4 45	Mean, 16 stations
Springfield	39 48	89 40	1896.1	4 10	3 46	Allen Enos
Palermo	39 53	87 52	1879.7	5 12	3 42	J. H. Darling
Piatt County	.. ..	.. ..	1901	4 28	4 25	W. J. Day
Virginia	39 58	90 13	1894	5 09	4 38	County surveyor
Beardstown	40 00	90 29	1880.6	6 43.4	5 17	F. E. Nipher
Menard County	.. ..	.. ..	1895	4 50	4 24	County surveyor
Rushville	40 07	90 35	1895	5 15	4 49	J. Stumm
Clinton	40 10	88 58	1892	4 45	4 06	J. S. Brown
Lincoln University	40 10	89 24	1901.3	4 00	3 57	W. P. Russell
Champaign County	.. ..	.. ..	1822	7 48	4 32	Mean, 32 stations
Vermilion County	.. ..	.. ..	1821	8 15	4 59	Mean, 38 stations
Pilot Grove	40 12	87 50	1879.7	4 29	2 59	J. H. Darling
Logan County	40 12	89 26	1901	4 45	4 42	D. L. Brancher
Havana	40 18	90 04	1892	4 47	4 08	County surveyor
Mason County	40 19	90 05	1896.7	4 44	4 22	J. R. Faulkner
Hancock County	.. ..	.. ..	1901	5 15	5 12	J. R. Crabill
Mason County	40 27	89 58	1901.2	4 23	4 20	J. R. Faulkner
Tazewell County	.. ..	.. ..	1824	8 00	4 43	Mean, 5 stations
McLean County	.. ..	.. ..	1824	8 00	4 43	Mean, 4 stations
Bloomington	40 31	88 59	1896	3 15	2 53	County surveyor
Ford County	.. ..	.. ..	1831	7 52	4 33	Mean, 12 stations
Peoria	40 41	89 34	1900.5	5 06	5 00	Hammond, Comstock
Iroquois County	.. ..	.. ..	1824	7 53	4 36	Mean, 34 stations
Woodford County	.. ..	.. ..	1826	7 57	4 39	Mean, 9 stations
Peoria County	.. ..	.. ..	1830	8 12	4 52	Mean, 20 stations
Livingston County	.. ..	.. ..	1833	7 31	4 13	Mean, 8 stations
Minonk	40 55	89 02	1901.2	4 05	4 02	D. H. Davison
Galesburg	40 55	90 23	1895	5 25	4 56	C.S. Richey
Knox County	.. ..	.. ..	1901	4 40	4 37	Do.
Little York	41 00	90 45	1895	5 56	5 27	County surveyor
Stark County	.. ..	.. ..	1820	8 05	4 39	Mean, 7 stations

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

ILLINOIS—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Marshall County	.. ..	.. ..	1828	8 05	4 34	Mean, 17 stations
Wenona	41 05	89 01	1872.7	6 06.1	3 59	T. C. Hilgard
Kankakee County	.. ..	.. ..	1833	7 18	3 48	Mean, 17 stations
Putnam County	.. ..	.. ..	1826	8 11	4 41	Mean, 10 stations
Stark County	.. ..	.. ..	1901	4 45	4 42	H. H. Oliver
Aledo	41 11	90 48	1901.4	5 10	5 07	W. B. Frew
Grundy County	.. ..	.. ..	1821	8 06	4 39	Mean, 15 stations
Hennepin	41 15	89 21	1895	4 57	4 28	County surveyor
Tiskilwa	41 17	89 29	1893	4 48	4 10	Do.
Bureau County	.. ..	.. ..	1827	8 11	4 41	Mean, 24 stations
Lasalle County	.. ..	.. ..	1822	8 06	4 39	Mean, 26 stations
Morris	41 21	88 27	1892	5 32	4 49	County surveyor
Rock Island County	.. ..	.. ..	1901	5 40	5 37	M. A. Gould
Will County	.. ..	.. ..	1825	7 47	4 18	Mean, 16 stations
Geneseo	41 26	90 10	1901	5 00	4 57	C. C. Martin
Rock Island	41 31	90 34	1878.7	6 57.8	5 25	C. F. Powell
Kendall County	.. ..	.. ..	1833	8 06	4 36	Mean, 6 stations
Willow Springs	41 44	87 51	1879.6	5 10	3 31	J. H. Darling
Mount Forest	41 45	87 52	1876.7	4 35.6	2 50	D. W. Lockwood
Lee County	.. ..	.. ..	1843	7 38	4 16	Mean, 6 stations
Whiteside County	.. ..	.. ..	1843	7 26	4 04	Mean, 3 stations
Dupage County	.. ..	.. ..	1834	7 17	3 47	Mean, 6 stations
Cook County	.. ..	.. ..	1829	7 19	3 47	Mean, 34 stations
Fulton	41 52	90 12	1844.1	8 15	5 00	Public survey
Dekalb County	.. ..	.. ..	1841	7 12	3 45	Mean, 3 stations
Kane County	.. ..	.. ..	1840	6 02	2 36	Mean, 10 stations
Winetka	42 06	87 44	1873.5	4 58	2 54	H. Custer
Stephenson County	.. ..	.. ..	1895	6 00	5 31	County surveyor
Woodstock	42 18	88 26	1901.2	3 13	3 10	C. H. Tryon
McHenry County	.. ..	.. ..	1839	6 14	2 46	Mean, 12 stations
Lake County	.. ..	.. ..	1840	5 56	2 30	Mean, 13 stations
Waukegan	42 21	87 50	1873.5	5 11	3 07	H. Custer
Jo Daviess County	42 25	90 27	1900.3	5 58	5 51	J. C. Scott
Do.	42 26	90 25	1901.2	6 30	6 27	Do.
Galena	42 26	90 26	1876.7	9 08.7	7 28	C. F. Powell
Sherwood	42 27	90 37	1839.8	9 00	5 45	Surveyor of P. L.
Jo Daviess County	42 28	90 03	1899.7	4 29	4 19	J. C. Scott
Dunleith	42 28	90 40	1856.8	8 35	5 51	K. Friesach

INDIANA

Group I	° ′	° ′		*East* ° ′	*East* ° ′	
Evansville	37 59	87 28	1900.94	3 49.6	3 46	W. F. Wallis
New Harmony	38 08	87 56	1880.84	5 05.1	3 42	J. B. Baylor
Paoli	38 32	86 27	1900.72	2 35.2	2 30	W. C. Dibrell
Vincennes	38 41	87 32	1896.33	3 17.9	2 57	R. L. Faris
Madison	38 42	85 27	1900.71	1 36.1	1 31	W. C. Dibrell
Bloomfield	39 02	86 56	1900.73	2 45.8	2 41	Do.
Greensburg	39 25	85 29	1900.70	2 11.4	2 06	Do.
Martinsville	39 25	86 24	1900.70	2 19.2	2 14	Do.
Terre Haute	39 30	87 23	1900.74	2 44.0	2 39	Do.

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

INDIANA—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group I—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Indianapolis	39 47	86 12	1900.69	1 21.1	1 16	W. C. Dibrell
Richmond	39 50	84 53	1900.68	1 39.2	1 34	Do.
Crawfordsville	40 03	86 52	1900.75	2 22.1	2 17	Do.
Hartford City	40 29	85 23	1900.76	1 56.6	1 51	Do.
Kokomo	40 31	86 05	1900.76	1 48.8	1 44	Do.
Fort Wayne	41 06	85 08	1900.77	0 12.8	0 07	Do.
Warsaw	41 12	85 52	1900.78	1 00.4	0 55	Do.
South Bend	41 40	86 14	1900.79	1 25.4	1 20	Do.
Michigan City	41 42	86 58	1900.88	1 45.6	1 41	W. G. Cady
Group II						
Rockport	37 54	87 04	1895	3 50	3 24	County surveyor
Perry County	37 57	86 46	1900	2 55	2 49	George Minto
Mount Vernon	37 57	87 55	1895	3 38	3 12	County surveyor
Mouth of Wabash River	38 00	88 00	1810.5	7 10	3 16	J. Mansfield
Spencer County	.. ..	.. ..	1805	6 30	2 43	Mean, 12 stations
Posey County	.. ..	.. ..	1806	6 57	3 08	Mean, 13 stations
Perry County	.. ..	.. ..	1805	6 30	2 43	Mean, 4 stations
Warrick County	.. ..	.. ..	1806	6 37	2 48	Mean, 9 stations
Canal	38 06	87 24	1895	3 38	3 12	County surveyor
Ohio River	38 10	86 30	1810.5	6 30	2 36	J. Mansfield
New Albany	38 16	85 54	1898.7	1 54	1 41	Willis L. Barnes
Floyd County	.. ..	.. ..	1806	5 27	1 38	Mean, 3 stations
Gibson County	.. ..	.. ..	1806	6 44	2 55	Mean, 13 stations
Falls of the Ohio River	38 20	85 40	1810.5	5 50	1 56	J. Mansfield
Dubois County	.. ..	.. ..	1805	6 37	2 50	Mean, 13 stations
Pike County	.. ..	.. ..	1805	6 37	2 50	Mean, 7 stations
Charleston	38 26	85 39	1899.8	1 48	1 39	Willis L. Barnes
Clark County	.. ..	.. ..	1807	5 00	1 10	1 station
Orange County	.. ..	.. ..	1805	6 00	2 13	Mean, 7 stations
Washington County	.. ..	.. ..	1807	6 16	2 26	Mean, 6 stations
Knox County	.. ..	.. ..	1808	6 36	2 44	Mean, 10 stations
Scott County	.. ..	.. ..	1810	6 10	2 16	Mean, 3 stations
Martin County	.. ..	.. ..	1806	6 33	2 44	Mean, 6 stations
Daviess County	.. ..	.. ..	1806	6 50	3 01	Mean, 9 stations
Jefferson County	.. ..	.. ..	1807	6 10	2 20	1 station
South Hanover	38 45	85 23	1837.5	4 35	0 52	Dunn
Madison	38 46	85 24	1898.7	1 30	1 17	Willis L. Barnes
Switzerland County	.. ..	.. ..	1800	5 10	1 31	Mean, 4 stations
Lawrence County	.. ..	.. ..	1812	7 03	3 08	Mean, 5 stations
Jackson County	.. ..	.. ..	1814	6 35	2 39	Mean, 3 stations
Ohio County	.. ..	.. ..	1800	5 10	1 31	Mean, 4 stations
Jennings County	.. ..	.. ..	1809	5 34	1 41	Mean, 7 stations
Vernon	39 00	85 37	1895	1 46	1 20	County surveyor
Bloomfield	39 03	86 54	1899.1	2 40	2 28	Willis L. Barnes
Greene County	.. ..	.. ..	1814	7 03	3 07	Mean, 6 stations
Sullivan County	.. ..	.. ..	1814	6 33	2 37	Mean, 11 stations
Ripley County	.. ..	.. ..	1817	5 55	1 57	Mean, 2 stations
Dearborn County	.. ..	.. ..	1800	5 10	1 31	Mean, 11 stations
Monroe County	.. ..	.. ..	1820	6 34	2 35	Mean, 4 stations
Brown County	.. ..	.. ..	1820	6 45	2 46	Mean, 5 stations
Bartholomew County	.. ..	.. ..	1820	6 08	2 09	Mean, 7 stations
Owen County	.. ..	.. ..	1814	6 40	2 44	Do.
Decatur County	.. ..	.. ..	1820	6 40	2 41	Mean, 9 stations

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

INDIANA—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Clay County	.. ..	.. ..	1814	6 36	2 40	Mean, 4 stations
Franklin County	.. ..	.. ..	1808	5 52	2 00	Mean, 10 stations
Vigo County	.. ..	.. ..	1815	6 44	2 47	Mean, 8 stations
Morgan County	.. ..	.. ..	1821	6 10	2 11	Mean, 13 stations
Johnson County	.. ..	.. ..	1821	6 00	2 01	Mean, 9 stations
Franklin	39 30	86 03	1894	2 36	2 06	County surveyor
Terre Haute	39 30	87 23	1901	2 36	2 33	—— McCormick
Shelby County	.. ..	.. ..	1820	7 00	3 01	Mean, 10 stations
Rush County	.. ..	.. ..	1820	7 06	3 07	Mean, 9 stations
Rushville	39 38	85 27	1899.5	1 12	1 02	Willis L. Barnes
Liberty	39 39	84 56	1895	1 30	1 04	County surveyor
Union County	.. ..	.. ..	1800	5 07	1 28	Mean, 7 stations
Fayette County	.. ..	.. ..	1817	6 16	2 18	Mean, 6 stations
Putnam County	.. ..	.. ..	1820	6 25	2 26	Mean, 7 stations
Greencastle	39 40	86 51	1895	2 39	2 13	County surveyor
Parke County	.. ..	.. ..	1820	6 36	2 37	Mean, 9 stations
Hendricks County	.. ..	.. ..	1821	5 50	1 51	Mean, 11 stations
Marion County	.. ..	.. ..	1821	5 57	1 58	Mean, 6 stations
Hancock County	.. ..	.. ..	1821	6 39	2 40	Mean, 11 stations
Wayne County	.. ..	.. ..	1809	5 10	1 17	Mean, 8 stations
Vermilion County	.. ..	.. ..	1818	6 54	2 56	Mean, 4 stations
Henry County	.. ..	.. ..	1821	6 11	2 12	Do.
Montgomery County	.. ..	.. ..	1821	6 41	2 42	Mean, 7 stations
Boone County	.. ..	.. ..	1824	5 55	1 58	Mean, 6 stations
Hamilton County	.. ..	.. ..	1822	5 42	1 44	Mean, 5 stations
Madison County	.. ..	.. ..	1822	6 03	2 05	Mean, 14 stations
Randolph County	.. ..	.. ..	1817	5 50	1 52	Mean, 12 stations
Fountain County	.. ..	.. ..	1822	6 50	2 52	Mean, 4 stations
Delaware County	.. ..	.. ..	1823	6 23	2 26	Mean, 18 stations
Clinton County	.. ..	.. ..	1832	5 10	1 19	Mean, 7 stations
Tipton County	.. ..	.. ..	1843	4 47	1 16	Mean, 6 stations
Warren County	.. ..	.. ..	1826	6 35	2 39	Mean, 4 stations
Tippecanoe County	.. ..	.. ..	1823	6 05	2 08	Mean, 9 stations
Jay County	.. ..	.. ..	1823	5 57	2 00	Mean, 11 stations
Blackford County	.. ..	.. ..	1823	6 20	2 23	Mean, 5 stations
Howard County	.. ..	.. ..	1844	4 36	1 07	Mean, 8 stations
Grant County	.. ..	.. ..	1834	5 45	1 58	Mean, 12 stations
Carroll County	.. ..	.. ..	1829	5 33	1 39	Mean, 8 stations
Benton County	.. ..	.. ..	1832	6 23	2 33	Mean, 13 stations
Wells County	.. ..	.. ..	1826	5 57	2 01	Mean, 9 stations
Adams County	.. ..	.. ..	1822	5 42	1 44	Mean, 3 stations
Miami County	.. ..	.. ..	1840	5 19	1 41	Mean, 12 stations
Cass County	.. ..	.. ..	1830	5 42	1 49	Mean, 10 stations
Logansport	40 45	86 24	1836.5	5 35	1 51	Town map
Reynolds	40 45	86 48	1874.7	3 30.3	1 42	F. E. Hilgard
White County	.. ..	.. ..	1831	5 55	2 03	Mean, 13 stations
Monticello	40 46	86 46	1895	3 15	2 49	County surveyor
Wabash	40 48	85 50	1898.7	0 37	0 24	Willis L. Barnes
Wabash County	.. ..	.. ..	1838	5 40	1 59	Mean, 16 stations
Huntington County	.. ..	.. ..	1831	5 54	2 02	Mean, 7 stations
Newton County	.. ..	.. ..	1835	6 28	2 42	Mean, 15 stations
Jasper County	.. ..	.. ..	1834	5 45	1 58	Mean, 16 stations
Pulaski County	.. ..	.. ..	1834	5 32	1 45	Mean, 11 stations
Fulton County	.. ..	.. ..	1834	5 51	2 04	Mean, 7 stations
Allen County	.. ..	.. ..	1832	5 26	1 36	Mean, 15 stations

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

INDIANA—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		East ° ′	East ° ′	
Whitley County	.. ..	.. ..	1833	5 50	2 01	Mean, 8 stations
Kosciusko County	.. ..	.. ..	1835	5 53	2 07	Mean, 16 stations
Marshall County	.. ..	.. ..	1833	6 14	2 25	Mean, 12 stations
Starke County	.. ..	.. ..	1834	5 32	1 45	Mean, 8 stations.
Noble County	.. ..	.. ..	1834	5 17	1 30	Mean, 12 stations
Dekalb County	.. ..	.. ..	1832	5 00	1 10	Do.
Lake County	.. ..	.. ..	1834	6 27	2 40	Mean, 23 stations
Crown Point	41 25	87 21	1895	4 15	3 47	County surveyor
Porter County	.. ..	.. ..	1834	6 38	2 51	Mean, 6 stations
Laporte County	.. ..	.. ..	1833	6 00	2 11	Mean, 17 stations
St. Joseph County	.. ..	.. ..	1834	5 50	2 03	Mean, 12 stations
Elkhart County	.. ..	.. ..	1830	5 27	1 34	Mean, 13 stations
Grand Calumet River	41 37	87 15	1871.7	4 30	2 23	L. Foote
Lagrange County	.. ..	.. ..	1831	5 20	1 28	Mean, 12 stations
Steuben County	.. ..	.. ..	1831	4 58	1 06	Do.

INDIAN TERRITORY

Group I	° ′	° ′		East ° ′	East ° ′	
Atoka	34 24	96 05	1878.54	9 11.4	7 59	J. B. Baylor
Eufaula	35 16	95 33	1878.54	9 10.3	7 58	Do.
Vinita	36 38	95 08	1888.78	8 48.3	8 05	Do.
Group II						
Chickasaw Nation, SE.	.. ..	.. ..	1871	10 07	8 38	Mean, 33 stations
Chickasaw Nation, SW.	.. ..	.. ..	1871	10 30	9 01	Do.
Choctaw Nation, W.	.. ..	.. ..	1895	8 16	7 54	Mean, 28 stations
Chickasaw Nation, NE.	.. ..	.. ..	1871	9 58	8 29	Mean, 25 stations
Chickasaw Nation, NW.	.. ..	.. ..	1871	10 46	9 17	Mean, 29 stations
Wilson Rock	35 19	94 37	1870.3	9 20	7 49	S. T. Albert
Jack Browns	35 20	94 45	1870.3	9 26	7 55	Do.
Canadian	35 25	95 00	1870.3	9 09	7 38	Do.
Webber Falls	35 30	95 07	1870.3	9 30	7 59	Do.
Creek Nation	.. ..	.. ..	1896	8 38	8 19	Mean, 5 stations
Fort Gibson	35 48	95 20	1870.3	9 48	8 17	S. T. Albert
Northeastern reservations	.. ..	.. ..	1875	9 12	7 53	Mean, 12 stations

IOWA

Group I	° ′	° ′		East ° ′	East ° ′	
Keokuk	40 23	91 23	1900.79	5 52.6	5 47	W. F. Wallis
Corydon	40 44	93 19	1900.78	8 13.6	8 08	Do.
Burlington	40 48	91 08	1900.51	6 05.2	5 58	Do.
Fairfield	41 00	91 59	1900.51	6 51.3	6 46	Do.
Red Oak	41 01	95 11	1900.76	8 43.4	8 38	Do.
Osceola	41 01	93 45	1900.77	7 08.2	7 03	Do.
Ottumwa	41 02	92 25	1888.70	7 49.2	6 52	J. B. Baylor
Creston	41 03	94 19	1900.77	9 00.0	8 54	W. F. Wallis

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

IOWA—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group I—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Council Bluffs	41 14	95 52	1900.69	9 32.2	9 26	W. F. Wallis
Washington	41 15	91 42	1900.52	6 42.5	6 36	Do.
Oskaloosa	41 18	92 39	1900.53	7 58.2	7 52	Do.
Atlantic	41 22	94 58	1900.74	10 01.2	9 56	Do.
Davenport	41 30	90 38	1888.68	6 09.1	5 12	J. B. Baylor
Menlo	41 31	94 23	1900.75	7 40.5	7 35	W. F. Wallis
Des Moines	41 36	93 36	1888.72	8 27.5	7 30	J. B. Baylor
Logan	41 39	95 47	1900.71	8 33.2	8 27	W. F. Wallis
Newton	41 42	93 04	1900.54	7 52.8	7 46	Do.
Marengo	41 46	92 04	1900.55	6 49.5	6 43	Do.
Onawa	42 01	96 04	1900.72	11 46.0	11 40	Do.
Carroll	42 02	94 50	1900.73	9 09.2	9 04	Do.
Boone	42 02	93 54	1900.63	6 56.7	6 50	Do.
Anamosa	42 07	91 15	1900.55	6 34.4	6 28	Do.
Ida Grove	42 21	95 27	1900.72	9 23.0	9 17	Do.
Eldora	42 21	93 05	1900.62	7 51.0	7 45	Do.
Sioux City	42 27	96 23	1891.67	10 34.2	9 49	J. B. Baylor
Dubuque	42 29	90 40	1900.56	5 30.2	5 24	W. F. Wallis
Manchester	42 29	91 27	1900.57	5 21.4	5 15	Do.
Waterloo	42 29	92 22	1900.58	7 14.0	7 08	Do.
Fort Dodge	42 30	94 12	1900.64	7 27.6	7 22	Do.
Fonda	42 35	94 50	1900.68	9 04.2	8 58	Do.
Hampton	42 44	93 11	1900.62	6 06.7	6 00	Do.
Cherokee	42 45	95 34	1900.67	10 28.3	10 22	Do.
Lemars	42 48	96 10	1900.67	10 01.7	9 56	Do.
West Union	42 54	91 50	1900.58	4 21.4	4 15	Do.
Charles City	43 03	92 41	1900.60	7 12.4	7 06	Do.
Emmetsburg	43 04	94 42	1900.65	10 02.6	9 56	Do.
Garner	43 05	93 36	1900.61	9 11.0	9 05	Do.
Hartley	43 10	95 29	1900.66	9 15.2	9 09	Do.
Perkins	43 11	96 11	1900.66	9 45.0	9 39	Do.
Decorah	43 18	91 49	1900.59	5 22.9	5 17	Do.
Sibley	43 24	95 43	1891.68	9 41.9	8 57	J. B. Baylor
Northwood	43 27	93 16	1900.60	6 57.1	6 51	W. F. Wallis
Group II						
Lee County	.. ..	.. ..	.....	.. ..	5 51	Mean, 3 stations
Bedford	40 41	94 42	1895	9 10	8 42	County surveyor
Ringgold County	40 43	94 14	1875.9	8 47	7 03	E. B. Heaton
Centerville	40. 43	92 50	1896	8 40	8 16	County surveyor
Clarinda	40 43	95 00	1875.9	10 42	8 58	J. W. McKinley
Page County	.. ..	.. ..	1893	9 12	8 35	A. S. von Sandt
Keosaugua	40 44	91 56	1901.2	7 30	7 26	W. A. Duckworth
Fremont County	40 44	95 37	1875.9	10 04	8 20	G. C. Houghton
Davis County	.. ..	.. ..	1895	8 10	7 42	Thomas Duffield
Decatur County	.. ..	.. ..	1895	7 57	7 29	County surveyor
Van Buren County	.. ..	.. ..	.....	.. ..	7 01	1 station
Near Winchester	40 50	91 56	1879.7	8 10	6 39	J. B. Kaufman
Des Moines County	.. ..	.. ..	1839	9 09	6 07	Mean, 16 stations
Henry County	.. ..	.. ..	1837	9 29	6 27	Mean, 6 stations
Jefferson County	.. ..	.. ..	1841	9 50	7 01	Do.
Wapello County	.. ..	.. ..	1844	9 49	7 01	Do.
Ottumwa	41 00	92 24	1895	7 25	6 57	County surveyor
Corning	41 00	94 43	1895	9 10	8 42	Do.

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

IOWA—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Albia	41 01	92 47	1875.9	9 05	7 21	C. Paine
Lucas	41 03	93 28	1901	7 40	7 37	S. B. Roddy
Afton	41 03	94 10	1895	8 40	8 12	M. V. Ashby
Glenwood	41 04	95 42	1900.5	9 32	9 25	S. Dean
Wapello	41 10	91 11	1901.0	5 40	5 36	W. S. Kremer
Louisa County	.. ..	.. ..	1839	8 20	5 18	Mean, 14 stations
Marion County	41 19	93 05	1898.8	8 03	7 49	Jasper Nye
Adair County	41 19	94 26	1875.9	10 28	8 44	A. R. Dew
Washington County	.. ..	.. ..	1839	9 28	6 38	Mean, 19 stations
Keokuk County	.. ..	.. ..	1843	9 32	6 44	Mean, 12 stations
Sigourney	41 21	92 11	1895	7 20	6 52	County surveyor
Pottawattamie County	.. ..	.. ..	.....	.. ..	9 21	Mean, 2 stations
Missouri River Bottom, near Long's Engr. Cantonment, 1819	41 24	95 44	1885.8	10 15	9 05	S. Dean
Muscatine County	.. ..	.. ..	1838	7 57	4 54	Mean, 15 stations
Do.	41 30	90 54	1900	4 55	4 48	R. H. McCampbell
Near Atalissa	41 38	91 15	1882.6	7 20.5	6 00	F. E. Nipher
Lost Grove	41 39	.. ..	1839.7	8 10	5 08	J. Locke
Shelby County	41 39	95 16	1875.9	11 44	10 00	W. Wyland
Iowa City	41 40	91 32	1897.6	6 54	6 35	L. A. Parsons
Near Iowa City	41 40	91 36	1880.5	8 49.8	7 21	F. E. Nipher
Johnson County	.. ..	.. ..	1840	9 00	6 10	Mean, 18 stations
Iowa County	.. ..	.. ..	1843	9 08	6 20	Mean, 11 stations
Guthrie County	.. ..	.. ..	1895	7 45	7 17	County surveyor
Aikins, Cedar County	41 43	91 14	1882.7	7 48.4	6 28	F. E. Nipher
Wapsipinicon River	41 44	90 23	1839.7	8 25	5 23	J. Locke
Cedar County	.. ..	.. ..	1838	9 03	6 01	Mean, 17 stations
Tipton	41 45	91 08	1895	6 45	6 17	John Zuck
Dewitt	41 49	90 40	1878	6 30	4 54	R. G. Brown
Clinton County	41 52	90 23	1899.3	4 22	4 10	A. Schnell
Do.	.. ..	.. ..	1838	8 28	5 26	Mean, 24 stations
Iron Ore	41 55	90 40	1839.7	7 42.5	4 40	J. Locke and other observers
Elwood	42 00	90 52	1839.7	9 15	6 13	J. Locke
Toledo	42 00	92 34	1901.0	7 38	7 34	W. Holstead
Denison	42 00	95 18	1875.9	10 46	9 02	M. McHenry
Crawford County	.. ..	.. ..	1854	10 36	8 00	Mean, 10 stations
Monona County	.. ..	.. ..	1855	11 08	8 32	Mean, 4 stations
Carroll County	.. ..	.. ..	1853	11 30	8 51	Mean, 30 stations
Greene County	.. ..	.. ..	.....	.. ..	8 16	Mean, 4 stations
Do.	42 01	94 20	1875.9	10 37	8 53	N. P. & L. Stillson
Story County	.. ..	.. ..	.....	.. ..	6 31	Mean, 2 stations
Ames	42 02	93 35	1900.3	6 27	6 20	College students
Story County	42 02	93 26	1900.3	7 44	7 37	Hodson & Deering
Marshalltown	42 03	92 53	1895	8 00	7 32	County surveyor
Small Mill	42 04	91 02	1839.8	9 04	6 02	J. Locke
Benton County	.. ..	.. ..	1843	9 35	6 47	Mean, 10 stations
Linn County	.. ..	.. ..	1842	9 32	6 44	Mean, 8 stations
Jones County	.. ..	.. ..	1838	9 22	6 33	Mean, 7 stations
Bridge	42 06	91 02	1839.8	9 20	6 18	J. Locke
Mill	42 10	90 37	1839.8	9 15	6 13	Do.
Vinton	42 10	92 01	1875.9	8 38	6 54	J. A. Brown
Jackson County	.. ..	.. ..	1839	8 19	5 29	Mean, 28 stations
Cheney's	42 12	90 21	1839.8	9 05	6 03	J. Locke

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

IOWA—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Farmers Creek	42 13	90 23	1839.8	9 11	6 09	J. Locke
Maquoketa River	42 14	90 57	1839.8	8 45	5 43	Do.
White Water	42 18	90 38	1839.8	9 10	6 00	J. Locke
Woodbury County	.. ..	.. ..	1855	12 00	9 40	Mean, 9 stations
Ida County	.. ..	.. ..	1854	11 24	9 03	Do.
Sac County	.. ..	.. ..	1853	10 02	7 33	Mean, 23 stations
Delaware County	42 20	91 08	1890	6 40	5 47	A. G. Wilson
Hopkinton	42 20	91 14	1890.3	5 35	4 42	Do.
North Branch Maquoketa R.	42 23	90 52	1839.8	9 35	6 25	J. Locke
Webster County	.. ..	.. ..	1852	10 11	7 31	Mean, 17 stations
Manson	42 29	94 30	1894	9 25	8 52	County surveyor
Dubuque County	.. ..	.. ..	1839	8 40	5 30	Mean, 20 stations
Little Maquoketa River	42 31	90 31	1839.8	8 30	5 20	J. Locke
Sherald Mound	42 35	90 33	1839.8	8 10	5 00	Do.
Log House	42 38	90 43	1839.8	9 00	5 50	Do.
Turkey River	42 42	91 02	1839.8	9 00	5 50	Do.
Humboldt County	.. ..	.. ..	1853	10 02	7 23	Mean, 13 stations
Buena Vista County	.. ..	.. ..	1855	10 36	8 06	Mean, 23 stations
Plymouth County	.. ..	.. ..	1855	11 53	9 33	Mean, 8 stations
Cherokee County	.. ..	.. ..	1855	12 42	10 22	Mean, 17 stations
Cherokee Eclipse Station	42 46	95 38	1869.6	11 32	9 35	J. Blickensderfer
Pocahontas County	.. ..	.. ..	1855	11 40	9 04	Mean, 36 stations
Rolfe	42 48	94 29	1894	9 33	9 00	County surveyor
Fayette County	.. ..	.. ..	1849	7 40	4 50	Mean, 2 stations
Clayton County	.. ..	.. ..	1843	8 48	5 40	Mean, 9 stations
Do.	42 50	91 24	1875.9	6 24	4 34	S. L. Peck
Gillett Grove	43 01	95 00	1893	8 45	8 07	P. M. Moore
Clay County	.. ..	.. ..	1857	10 56	8 23	Mean, 15 stations
Ferry, opp. Prairie du Chien	43 03	91 11	1839.8	9 05	5 55	J. Locke
Sioux County	.. ..	.. ..	1856	11 17	9 00	Mean, 8 stations
O'Brien County	.. ..	.. ..	1857	11 24	9 00	Mean, 16 stations
Palo Alto County	.. ..	.. ..	1854	11 45	9 07	Do.
Kossuth County	.. ..	.. ..	1854	10 28	7 50	Mean, 4 stations
Allamakee County	.. ..	.. ..	1851	9 00	6 00	Mean, 18 stations
Winneshiek County	.. ..	.. ..	1850	8 00	5 00	Mean, 16 stations
Emmet County	.. ..	.. ..	1858	11 06	8 35	Mean, 12 stations
Lyon County	.. ..	.. ..	1858	11 55	9 35	Mean, 6 stations
Cresco	43 21	92 06	1875.9	8 52	7 08	L. Hassett
Dickinson County	.. ..	.. ..	1857	12 32	10 05	Mean, 12 stations
Osceola County	.. ..	.. ..	1858	11 24	9 00	Mean, 11 stations
Do.	43 30	95 44	1900.3	7 45	7 37	M. J. Campbell

KANSAS

Group I	° ′	° ′		*East* ° ′	*East* ° ′	
Liberal	37 02	100 54	1900.89	11 15.0	11 11	W. C. Dibrell
Richfield	37 16	101 46	1900.88	11 42.8	11 39	Do.
Wichita	37 40	97 20	1888.79	10 09.7	9 27	J. B. Baylor
Dodge City	37 44	99 59	1888.80	11 46.0	11 05	Do.
Humboldt	37 49	95 26	1878.55	10 04.9	8 52	Do.
Sargent	38 05	101 58	1878.61	12 44.3	11 39	Do.

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

KANSAS—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group I—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Burlington	38 12	95 48	1900.47	9 08.9	9 04	C. K. Edmunds
Garnett	38 16	95 17	1900.47	9 34.0	9 29	Do.
Great Bend, Fort Zarah	38 24	98 43	1878.58	11 05.0	9 56	J. B. Baylor
Emporia	38 26	96 12	1888.77	10 08.7	9 24	Do.
Lacrosse	38 36	99 16	1892.65	11 03.9	10 34	F. D. Granger
Lyndon	38 37	95 41	1900.46	9 57.5	9 52	C.K. Edmunds
Ottawa	38 38	95 16	1900.46	8 23.4	8 18	Do.
Skaggs	38 40	99 45	1893.54	10 59.4	10 33	F. D. Granger
Fairmount	38 41	99 00	1892.60	11 06.3	10 36	Do.
Schmidt	38 42	100 03	1893.50	11 30.8	11 04	Do.
Smoky Hill	38 44	99 33	1893.59	11 12.1	10 45	Do.
Baldwin	38 47	95 10	.....	.. ....	8 23	W. C. Bauer
Olathe	38 49	95 01	1901.62	9 02.9	9 02	J. M. Kuehne
Allen	38 50	98 52	1892.55	10 20.7	9 48	F. D. Granger
Curlew	38 50	101 46	1892.57	12 37.4	12 07	F. W. Perkins
Southeast Base	38 51	98 47	1893.68	10 33.5	10 07	F. D. Granger
Northwest Base	38 54	98 50	1892.84	10 35.7	10 06	Do.
Trego	38 54	99 38	1893.63	11 19.1	10 52	Do.
Hays	38 55	99 16	1892.70	11 26.0	10 56	Do.
Big Creek	38 56	99 54	1893.42	10 59.6	10 32	Do.
Lawrence	38 58	95 15	1877.87	9 51.6	8 39	A. Braid
Blue Hill	38 59	99 06	1892.77	11 10.0	10 41	F. D. Granger
McLane	39 02	101 57	1892.58	12 03.1	11 33	F. W. Perkins
Junction City	39 02	96 53	1888.76	10 05.5	9 21	J. B. Baylor
Waldo	39 10	98 50	1892.51	11 17.6	10 47	F. D. Granger
Holton	39 28	95 44	1900.59	9 22.2	9 17	W. C. Bauer
Marysville	39 50	96 39	1900.60	9 03.8	8 59	Do.
Hiawatha	39 51	95 32	1900.65	9 31.8	9 27	J. W. Miller
Group II						
Sedan	37 07	96 10	1900.0	8 49	8 42	A. J. Denick
Chautauqua County	.. ..	.. ..	1871	10 25	8 56	Mean, 16 stations
Anthony	37 10	98 01	1896	9 50	9 32	J. B. Lee
Harper County	.. ..	.. ..	1876	10 50	9 37	Mean, 21 stations
Comanche County	.. ..	.. ..	1871	12 00	10 40	Mean, 33 stations
Seward County	.. ..	.. ..	1874	11 54	10 41	Mean, 13 stations
Stevens County	.. ..	.. ..	1874	12 18	11 05	Mean, 8 stations
Morton County	.. ..	.. ..	1874	12 20	11 07	Mean, 15 stations
Cherokee County	.. ..	.. ..	1868	10 25	8 51	Mean, 20 stations
Winfield	37 14	96 58	1895	9 15	8 53	County surveyor
Independence	37 14	95 42	1901	7 55	7 53	S. L. Hibbard
Meade County	.. ..	.. ..	1873	11 55	10 40	Mean, 9 stations
Clark County	.. ..	.. ..	1871	11 50	10 31	Mean, 27 stations
Barber County	.. ..	.. ..	1873	11 45	10 30	Mean, 36 stations
Sumner County	.. ..	.. ..	1871	11 20	9 56	Mean, 29 stations
Cherryvale	37 17	95 33	1895	8 28	8 06	County surveyor
Meade	37 18	100 21	1896	11 10	10 52	Do.
Weir	37 19	94 45	1896	8 03	7 44	W. H. Dugger
Parsons	37 20	95 17	1879.6	9 32.9	8 22	F. E. Nipher
Moline	37 21	96 17	1895	9 10	8 48	J. T. Chapman
Elk County	.. ..	.. ..	1867	11 27	9 51	Mean, 7 stations
Crawford County	.. ..	.. ..	1867	12 03	10 27	Mean, 2 stations
Neosho County	.. ..	.. ..	1867	12 03	10 27	Mean, 3 stations

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

KANSAS—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Wilson County	.. ..	.. ..	1867	11 14	9 38	Mean, 12 stations
Kingman County	.. ..	.. ..	1869	11 30	10 02	Mean, 24 stations
Kiowa County	.. ..	.. ..	1869	12 05	10 42	Mean, 30 stations
Haskell County	.. ..	.. ..	1873	12 22	11 07	Mean, 13 stations
Grant County	.. ..	.. ..	1873	12 27	11 12	Mean, 8 stations
Stanton County	.. ..	.. ..	1873	12 36	11 21	Mean, 15 stations
Pratt	37 39	98 44	1895	10 24	10 02	County surveyor
Sedgwick County	.. ..	.. ..	1859	11 50	10 10	Mean, 12 stations
Wichita	37 41	97 20	1898.0	10 30	10 16	R. H. Brown
Ford County	.. ..	.. ..	1872	11 48	10 31	Mean, 7 stations
Dodge City	37 45	100 01	1895	10 30	10 09	J. G. Fonda
Gray County	.. ..	.. ..	1872	12 25	11 08	Mean, 5 stations
Butler County	.. ..	.. ..	1862	11 23	9 46	Mean, 23 stations
Eldorado	37 49	96 50	1895	9 35	9 14	T. H. Austin
Eureka	37 49	96 17	1895	9 32	9 11	H. E. Robb
Greenwood County	.. ..	.. ..	1867	11 30	9 54	Mean, 21 stations
Cimarron	37 50	100 21	1895	10 43	10 21	County surveyor
Yates Center	37 53	95 44	1895	9 20	8 59	Do.
Woodson County	.. ..	.. ..	1867	11 48	10 12	Mean, 7 stations
Allen County	.. ..	.. ..	1867	11 30	9 54	Mean, 6 stations
Bourbon County	.. ..	.. ..	1867	11 10	9 34	Do.
Reno County	.. ..	.. ..	1859	12 25	10 45	Mean, 9 stations
Edwards County	.. ..	.. ..	1871	12 05	10 46	Mean, 12 stations
Kinsley	37 55	99 24	1895	10 46	10 25	Cyrus Roberts
Finney County	.. ..	.. ..	1870	12 35	11 14	Mean, 15 stations
Kearney County	.. ..	.. ..	1871	12 48	11 29	Mean, 8 stations
Hamilton County	.. ..	.. ..	1872	12 45	11 28	Mean, 14 stations
St. John	38 00	98 45	1896	10 30	10 12	W. F. Noble.
Stafford County	.. ..	.. ..	1866	11 31	10 00	Mean, 4 stations
Hutchinson	38 03	97 55	1895	9 50	9 28	County surveyor
Newton	38 03	97 19	1895	10 05	9 43	James Dawson
Harvey County	.. ..	.. ..	1857	11 47	10 06	Mean, 5 stations
Hodgeman County	.. ..	.. ..	1870	12 06	10 45	Mean, 19 stations
Jetmore	38 05	99 53	1895	11 10	10 49	A. L. Hull
Mound City	38 09	94 49	1895	8 26	8 04	County surveyor
Linn County	.. ..	.. ..	1856	11 20	9 30	Mean, 6 stations
Garfield County	.. ..	.. ..	1870	12 40	11 19	Mean, 8 stations
Pawnee County	.. ..	.. ..	1867	12 30	11 05	Mean, 12 stations
Larned	38 11	99 06	1893	10 56	10 29	County surveyor
Anderson County	.. ..	.. ..	1856	11 37	9 47	Mean, 4 stations
Coffey County	.. ..	.. ..	1856	12 26	10 36	Mean, 5 stations
McPherson County	38 16	97 38	1901	9 53	9 50	H. A. Rowland
Lyons	38 20	98 12	1895	10 03	9 41	County surveyor
Rice County	.. ..	.. ..	1866	11 55	10 24	Mean, 9 stations
Chase County	.. ..	.. ..	1856	11 40	9 50	Do.
Marion County	.. ..	.. ..	1857	11 53	10 12	Mean, 12 stations
Marion	38 21	97 00	1893	9 57	9 28	County surveyor
McPherson	38 22	97 40	1901.0	9 47	9 44	H. A. Rowland
McPherson County	.. ..	.. ..	1858	12 26	10 45	Mean, 12 stations
Ness City	38 27	99 54	1895	11 22	11 01	County surveyor
Ness County	.. ..	.. ..	1869	12 40	11 18	Mean, 19 stations
Alexander	38 28	99 33	1879.7	12 10	11 07	J. B. Kaufman
Barton County	.. ..	.. ..	1866	11 50	10 19	Mean, 10 stations
Greeley County	.. ..	.. ..	1872	12 53	11 36	Mean, 13 stations

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

KANSAS—Continued

Station	Latitude	Longitude	Date of obsreva-tion	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Wichita County	.. ..	.. ..	1870	13 17	11 56	Mean, 8 stations
Scott County	.. ..	.. ..	1870	13 05	11 44	Mean, 15 stations
Lane County	.. ..	.. ..	1870	12 50	11 29	Mean, 12 stations
Lyon County	.. ..	.. ..	1856	12 25	10 35	Mean, 8 stations
McPherson County	38 31	97 22	1900.7	10 12	10 07	H. A. Rowland
Lacrosse	38 32	99 20	1895	10 22	10 00	County surveyor
Miami County	.. ..	.. ..	1856	11 48	9 58	Mean, 4 stations
Franklin County	.. ..	.. ..	1856	11 28	9 38	Do.
Osage County	.. ..	.. ..	1856	12 48	10 58	Mean, 3 stations
Morris County	.. ..	.. ..	1856	11 45	9 55	Mean, 8 stations
Ellsworth County	.. ..	.. ..	1859	12 38	10 57	Mean, 7 stations
Ellsworth	38 44	98 14	1895	10 17	9 55	County surveyor
Saline County	.. ..	.. ..	1858	12 15	10 34	Mean, 9 stations
Salina	38 51	97 36	....	.. ..	10 28	O. P. Hamilton
Johnson County	.. ..	.. ..	1856	10 30	8 40	Mean, 9 stations
Hays	38 52	99 19	1895	11 20	10 59	County surveyor
Ellis County	.. ..	.. ..	1868	12 10	10 46	Mean, 18 stations
Wallace	38 55	101 35	1872.8	13 17.9	12 01	T. C. Hilgard
Wallace County	.. ..	.. ..	1872	13 00	11 44	Mean, 15 stations
Logan County	.. ..	.. ..	1870	13 10	11 49	Mean, 9 stations
Gove County	.. ..	.. ..	1869	13 25	12 03	Mean, 12 stations
Trego County	.. ..	.. ..	1868	12 55	11 31	Mean, 15 stations
Russell County	.. ..	.. ..	1866	12 00	10 29	Do.
Dickinson County	.. ..	.. ..	1856	11 50	10 09	Mean, 10 stations
Abilene	38 56	97 11	1895	10 00	9 38	County surveyor
Ellis	38 56	99 34	1872.8	12 24.9	11 08	T. C. Hilgard
New Fort Hays	38 59	99 20	1867.5	12 48	11 23	M. R. Brown
Four miles north of Detroit	39 00	97 08	1879.7	10 45	9 35	J. B. Kaufman
Geary County	.. ..	.. ..	1857	12 10	10 20	Mean, 2 stations
Wabaunsee County	.. ..	.. ..	1856	11 44	9 54	Mean, 9 stations
Alma	39 01	96 16	1892	10 04	9 31	County surveyor
Shawnee County	.. ..	.. ..	1856	12 45	10 55	1 station
Lincoln County	.. ..	.. ..	1859	12 30	10 50	Mean, 9 stations
Ottawa County	.. ..	.. ..	1858	12 00	10 19	Do.
Wyandotte County	.. ..	.. ..	1855	11 13	9 22	Mean, 7 stations
Manhattan	39 10	96 34	1897.5	9 40	9 24	Noble & Paul
Riley County	.. ..	.. ..	1856	11 50	10 00	Mean, 8 stations
Jefferson County	.. ..	.. ..	1855	10 53	9 03	Mean, 4 stations
Leavenworth County	.. ..	.. ..	1855	11 20	9 30	Mean, 13 stations
Leavenworth	39 18	94 56	1900.0	8 40	8 33	E. Diefendorf
Goodland	39 19	101 42	1888.5	12 24	11 42	D. A. Long
Sherman County	.. ..	.. ..	1871	13 15	11 56	Mean, 13 stations
Riley County	39 20	96 52	1899.5	9 28	9 19	O. E. Noble
Osborne County	39 20	98 54	1899.5	10 58	10 49	A. P. Duryea
Do.	.. ..	.. ..	1864	12 09	10 35	Mean, 12 stations
Thomas County	.. ..	.. ..	1870	13 17	11 56	Mean, 23 stations
Sheridan County	.. ..	.. ..	1869	13 22	12 00	Mean, 10 stations
Rooks County	.. ..	.. ..	1865	12 50	11 23	Mean, 15 stations
Fort Leavenworth	39 21	94 54	1858.5	10 59	9 10	J. H. Simpson
Graham County	39 21	100 05	1898.5	11 55	11 43	J. W. Rawson
Do.	.. ..	.. ..	1867	12 50	11 25	Mean, 15 stations
Osborne County	39 22	98 47	1900.6	10 56	10 51	A. P. Duryea
Clay County	.. ..	.. ..	1857	12 30	10 49	Mean, 16 stations
Clay Center	39 22	97 06	1895	9 59	9 37	County surveyor

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

KANSAS—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Westmoreland	39 24	96 23	1895	9 08	8 46	County surveyor
Pottawatomie County	.. ..	.. ..	1855	12 00	10 09	Mean, 11 stations
Mitchell County	.. ..	.. ..	1862	12 50	11 13	Mean, 9 stations
Jackson County	.. ..	.. ..	1855	11 46	9 55	Mean, 5 stations
Stockton	39 26	99 17	1895	11 13	10 52	County surveyor
Osborne	39 27	98 41	1895	10 58	10 37	A. A. Nolan
Cloud County	.. ..	.. ..	1858	13 12	11 31	Mean, 12 stations
Concordia	39 34	97 40	1900.0	9 15	9 08	County surveyors
Atchison	39 34	95 09	1892	8 43	8 10	City engineer
Atchison County	.. ..	.. ..	1855	11 08	9 17	Mean, 16 stations
Jewell	39 40	98 09	1894	10 40	10 15	County surveyor
Jewell County	.. ..	.. ..	1862	12 28	10 51	Mean, 14 stations
Cheyenne County	.. ..	.. ..	1870	13 37	12 16	Mean, 19 stations
Rawlins County	.. ..	.. ..	1870	13 20	11 59	Mean, 17 stations
Decatur County	.. ..	.. ..	1864	13 30	12 03	Mean, 7 stations
Norton County	.. ..	.. ..	1865	13 00	11 33	Mean, 14 stations
Phillips County	.. ..	.. ..	1859	13 23	11 51	Mean, 18 stations
Phillipsburg	39 46	99 20	1895	10 58	10 37	F. R. Weeks
Smith County	.. ..	.. ..	1862	13 15	11 38	Mean, 11 stations
Smith Center	39 46	98 48	1895	11 39	11 17	W. H. Withington
Doniphan County	.. ..	.. ..	1855	11 20	9 29	Mean, 12 stations
Do.	39 47	95 06	1900.0	8 54	8 47	F. P. Marsh
Marshall County	.. ..	.. ..	1855	11 50	9 59	Mean, 18 stations
Nemaha County	.. ..	.. ..	1855	11 20	9 29	Mean, 22 stations
Washington County	39 49	97 02	1899.0	10 29	10 19	T. C. Edington
Do.	.. ..	.. ..	1856	11 57	10 06	Mean, 19 stations
Seneca	39 50	96 04	1900.0	8 52	8 45	M. Mathews
Republic County	.. ..	.. ..	1658	12 03	10 22	Mean, 9 stations
Brown County	.. ..	.. ..	1855	11 40	9 49	Mean, 23 stations
Vermilion Creek	39 57	96 16	1858.6	11 35	9 46	J. H. Simpson
Big Blue River	40 00	96 35	1858.6	14 10	12 21	Do.

KENTUCKY

Group I	° ′	° ′		*E or W* ° ′	*E or W* ° ′	
Hickman	36 34	89 12	1881.73	5 47.3 E	4 30 E	J. B. Baylor
Williamsburg	36 45	84 09	1900.47	0 50.4 E	0 45 E	D. L. Hazard
Mayfield	36 45	88 41	1881.74	5 12.9 E	3 55 E	J. B. Baylor
Russellville	36 50	86 53	1901.56	3 19.2 E	3 17 E	W. Weinrich
Twenty-seven Mile Island	36 57	88 14	1865.15	7 22 E	5 07 E	A. T. Mosman
Oakland	37 02	86 15	1871.85	6 14.2 E	4 23 E	Mosman & Smith
Patterson Landing	37 03	88 25	1865.18	6 44 E	4 29 E	A. T. Mosman
Upper Point of Rocks	37 04	88 17	1865.13	7 25 E	5 10 E	Do.
Paducah	37 04	88 37	1901.50	4 25.6 E	4 24 E	W. Weinrich
Princeton	37 07	87 53	1901.51	3 46.6 E	3 45 E	Do.
Greenville	37 13	87 11	1901.55	3 47.0 E	3 45 E	Do.
Madisonville	37 19	87 33	1881.76	5 06.2 E	3 49 E	J. B. Baylor
Livingston	37 20	84 14	1900.47	0 29.9 E	0 25 E	D. L. Hazard
Leitchfield	37 30	86 22	1881.77	3 19.3 E	2 04 E	J. B. Baylor
Stanford	37 31	84 44	1881.79	4 15.8 E	3 01 E	Do.

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

LOUISIANA—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Ascension Parish	.. ..	.. ..	1896	6 00	5 41	Parish surveyor
Lake Charles	30 13	93 12	1901	6 20	6 18	G. O. Elms
Calcasieu Parish	.. ..	.. ..	1867	8 20	6 32	Mean, 35 stations
West Baton Rouge Parish	.. ..	.. ..	1896	6 40	6 21	Parish surveyor
Covington	30 28	90 06	1901.0	5 19	5 16	G. D. Harris
St. Tammany Parish	.. ..	.. ..	1848	7 52	5 31	Mean, 32 stations
East Baton Rouge Parish	.. ..	.. ..	1896	6 00	5 41	R. Swart
Opelousas	30 32	92 04	1897	6 27	6 12	G. O. Elms
Chappeau	30 33	90 20	1895	6 00	5 38	Thomas Garahy
Tangipahoa Parish	.. ..	.. ..	1840	7 57	5 29	Mean, 13 stations
St. Landry Parish	.. ..	.. ..	1854	8 34	6 21	Mean, 52 stations
Pointe Coupee Parish	.. ..	.. ..	1852	8 35	6 19	Mean, 16 stations
St. Francisville	30 48	91 23	1901	6 05	6 03	W. B. Smith
West Feliciana Parish	.. ..	.. ..	1852	8 04	5 48	Mean, 12 stations
East Feliciana Parish	.. ..	.. ..	1853	8 00	5 45	Mean, 7 stations
Washington Parish	.. ..	.. ..	1845	7 55	5 31	Mean, 20 stations
Avoyelles Parish	.. ..	.. ..	1850	8 33	6 14	Mean, 18 stations
Vernon Parish	.. ..	.. ..	1877	7 40	6 19	Mean, 4 stations
Leesville	31 08	93 15	1901	6 30	6 28	Elzie Stokes
Alexandria	31 17	92 27	1872.3	7 43.9	6 08	T. C. Hilgard
Rapides Parish	.. ..	.. ..	1873	8 19	6 47	Mean, 6 stations
Gaines Ferry	31 28	93 45	1840.4	8 40.5	6 13	J. D. Graham
Concordia Parish	.. ..	.. ..	1837	8 32	6 04	Mean, 8 stations
Many	31 33	93 29	1901.2	6 56	6 53	D. Vandegaer
Sabine Parish	.. ..	.. ..	1895	6 30	6 08	1 station
Catahoula Parish	.. ..	.. ..	1844	8 38	6 15	Mean, 20 stations
Public Survey Station	31 40	92 32	1835.5	8 40	6 12	Public surveyor
Natchitoches	31 44	93 05	1895	7 05	6 43	Parish surveyor
Public Survey Station	31 45	92 22	1834.5	8 30	6 02	Public surveyor
Grand Ecore	31 48	93 07	1872.3	7 52.4	6 17	T. C. Hilgard
Public Survey Station	31 50	92 32	1834.5	8.30	6 02	Public surveyor
Tensas Parish	.. ..	.. ..	1839	8 20	5 52	Mean, 16 stations
Kelly	31 58	92 10	1899.0	6 32	6 22	A. J. McDaniel
Caldwell Parish	.. ..	.. ..	1842	8 40	6 14	Mean, 3 stations
Winnsboro	32 09	91 42	1900.5	6 00	5 55	B. W. Leigh
Franklin Parish	.. ..	.. ..	1838	8 28	6 00	Mean, 12 stations
Bossier Parish	32 16	93 28	1901	7 12	7 10	G. D. Alexander
Madison Parish	.. ..	.. ..	1838	8 25	5 57	Mean, 15 stations
Public Survey Station	32 25	92 32	1836.5	8 30	6 02	Public surveyor
Richland Parish	.. ..	.. ..	1841	8 23	5 56	Mean, 17 stations
Monroe	32 29	92 08	1872.3	7 35.5	6 00	T. C. Hilgard
Ouachita Parish	.. ..	.. ..	1848	8 30	6 09	Mean, 5 stations
Ruston	32 30	92 37	1900	6 30	6 25	H. T. Riser
Lincoln Parish	.. ..	.. ..	1895	7 00	6 38	1 station
Minden	32 35	93 17	1895	8 30	8 08	Parish surveyor
Aycock	32 42	92 54	1901	6 30	6 28	B. R. Coleman
Lake Providence	32 47	91 09	1894	6 30	6 04	Parish surveyor
East Carroll Parish	.. ..	.. ..	1846	8 10	5 47	Mean, 7 stations
West Carroll Parish	.. ..	.. ..	1855	8 22	6 10	Mean, 11 stations
Morehouse Parish	.. ..	.. ..	1854	8 25	6 12	Mean, 23 stations
Public Survey Station	32 50	92 22	1835.5	8 40	6 12	Public surveyor

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

MAINE

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group I	° ′	° ′		*West* ° ′	*West* ° ′	
Appledore Island	42 59	70 37	1847.62	10 03.5	13 13	T. J. Lee
Kittery Point	43 05	70 43	1898.86	13 12.3	13 18	E. Smith
Cape Neddick	43 12	70 36	1851.66	11 09.0	13 59	J. E. Hilgard
Agamenticus	43 13	70 42	1847.74	10 09.8	13 18	Lee & Fauntleroy
Kennebunk Port	43 21	70 28	1851.65	11 23.6	14 14	J. E. Hilgard
Fletcher Neck	43 27	70 20	1850.69	11 17.5	14 12	Do.
Richmond Island	43 33	70 14	1850.71	12 18.1	15 12	Do.
Portland	43 39	70 17	1895.57	14 16.2	14 29	J. B. Baylor
Harpswell	43 44	70 01	1863.55	14 25.5	16 24	C. A. Schott
Mount Independence	43 46	70 19	1849.77	11 46.4	14 44	G. Davidson
Cape Small	43 47	69 51	1851.80	12 05.5	14 44	G. W. Dean
Freeport	43 51	70 06	1863.53	14 11.7	16 00	C. A. Schott
Brunswick	43 54	69 58	1873.70	14 18.0	15 28	T. C. Hilgard
Bath	43 55	69 49	1863.52	12 51.8	14 40	C. A. Schott
Damariscotta	44 02	69 32	1887.60	15 12.8	15 40	J. B. Baylor
Mount Pleasant	44 02	70 49	1851.64	14 32.1	17 22	G. W. Dean
Rockland	44 06	69 06	1863.52	15 02.1	16 50	C. A. Schott
Mount Sabattus	44 09	70 05	1853.57	12 53.5	15 24	J. E. Hilgard
Camden Village	44 12	69 05	1854.83	13 57.1	16 22	Dean & Breckinridge
Mount Ragged	44 13	69 09	1854.74	14 16.8	16 42	Dean & Harris
South West Harbor	44 15	68 18	1856.74	15 25.2	17 30	S. Harris
Mount Desert	44 21	68 14	1856.77	15 14.2	17 20	G. W. Dean
Belfast	44 26	69 01	1863.52	15 30.3	17 18	C. A. Schott
Mill Bridge	44 32	67 54	1887.62	17 04.9	17 26	J. B. Baylor
Howard	44 38	67 24	1859.61	18 31.6	20 13	G. W. Dean
Mount Saunders	44 39	68 36	1856.82	14 59.4	17 04	Dean & Toomer
Epping Base, east end	44 40	67 50	1857.5	16 20	18 11	C. O. Boutelle
Mount Harris	44 40	69 09	1855.67	14 34.6	16 45	Dean & McIver
Farmington	44 40	70 09	1887.76	14 56.2	15 17	J. B. Baylor
Machiasport	44 41	67 24	1887.64	17 42.9	17 58	Do.
Pittsfield	44 46	69 22	1887.74	15 59.3	16 20	Do.
Bangor	44 48	68 47	1895.58	16 57.4	17 05	Do.
Humpback	44 52	68 07	1858.65	15 47.8	17 34	Dean & Mosman
Eastport	44 54	66 59	1895.61	18 53.2	18 58	J. B. Baylor
Cooper	44 59	67 28	1859.69	16 31.9	18 13	G. W. Dean
Calais	45 11	67 17	1895.64	17 25.3	17 30	G. R. Putnam
Greenville	45 28	69 36	1887.73	16 48.1	17 09	J. B. Baylor
Mattawamkeag	45 31	68 24	1887.72	17 56.6	18 12	Do.
Vanceboro	45 34	67 27	1887.70	18 21.6	18 37	Do.
Danforth	45 40	67 58	1887.71	18 22.7	18 38	Do.
Houlton	46 07	67 53	1887.68	19 00.3	19 15	Do.
Presque Isle	46 39	68 00	1887.66	20 03.8	20 19	Do.
Group II						
Hiram	43 50	70 45	1845.2	11 58	15 18	Wadsworth
Raymond	43 57	70 24	1838.5	9 45	13 33	3d Geol. Report
West Thomaston	44 05	69 05	1840.5	12 11	15 40	Do.
Greenwood	44 20	70 45	1845.5	12 08	15 25	Do.
Bethel	44 27	70 51	1845.5	11 50	15 07	Do.
Searsport	44 28	68 56	1901	16 20	16 21	J. W. Brock
North Vassalboro	44 30	69 40	1880.5	15 35	16 22	I. E. Getchell
Rumford	44 30	70 40	1840.5	11 10	14 50	3d Geol. Report
Steuben	44 31	67 58	1895	17 05	17 16	County surveyor

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

MARYLAND—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group I—Continued	° ′	° ′		*West* ° ′	*West* ° ′	
Middlebrook	39 11	77 14	1899.53	4 49.7	4 57	Vehrenkamp
Cross Roads I	39 11	77 12	1899.54	6 03.0	6 10	Do.
North Point	39 12	76 27	1847.32	1 39.6	5 06	T. J. Lee
Fairfax Stone	39 12	79 29	1897.59	3 07.2	3 21	L. A. Bauer
Camp Fairfax	39 13	79 29	1897.60	3 05.8	3 20	Do.
Chestertown	39 13	76 05	1897.41	5 47.0	6 02	Do.
Tolchester	39 13	76 14	1897.41	5 37.1	5 52	Do.
Dickerson	39 14	77 25	1900.25	2 33.0	2 38	J. A. Fleming
Unity	39 14	77 04	1896.87	5 36.0	5 52	L. A. Bauer
Backbone Mountain	39 14	79 29	1897.64	3 06.9	3 21	Do.
Baltimore, Fort McHenry	39 16	76 35	1895.74	5 20.3	5 40	J. B. Baylor
Ellicott City, S. M.	39 16	76 48	1900.45	5 12.9	5 18	Do.
Ellicott City, N. M.	39 16	76 48	1900.45	4 59.6	5 04	Do.
Ellicott City	39 16	76 48	1896.81	4 44.3	5 01	L. A. Bauer
Pooles Island	39 17	76 16	1847.48	2 29.3	5 55	T. J. Lee
Corunna, N. M.	39 17	79 23	1900.41	3 22.9	3 28	W. M. Brown
Damascus	39 17	77 12	1896.87	4 02.8	4 19	L. A. Bauer
Massey	39 18	75 48	1896.72	6 25.0	6 42	Do.
Rosanne	39 18	76 43	1845.44	2 10.9	5 43	T. J. Lee
Lisbon	39 20	77 04	1899.37	4 41.8	4 50	L. A. Bauer
Maryland Heights	39 20	77 43	1897.57	4 19.2	4 33	Do.
Betterton	39 22	76 04	1899.47	4 03.9	4 12	Do.
Lower Hill	39 22	79 29	1897.73	3 16.7	3 30	Do.
Sykesville	39 22	76 58	1899.37	6 24.0	6 32	Do.
Finlay	39 24	76 32	1846.29	2 18.5	5 48	Lee & Locke
Towson, M. L.	39 24	76 36	1897.32	5 46.6	6 01	L. A. Bauer
Oakland	39 25	79 25	1899.43	3 25.7	3 34	Do.
Frederick, Asylum	39 25	77 25	1896.76	4 42.2	4 59	Do.
Bradshaw	39 25	76 23	1897.37	5 18.8	5 34	Do.
Swanton	39 27	79 12	1899.44	3 36.6	3 44	Do.
Osbornes Ruin	39 28	76 17	1845.47	2 32.4	6 04	T. J. Lee
Belcamp	39 28	76 14	1896.85	6 05.7	6 22	L. A. Bauer
Reistertown	39 28	76 50	1899.38	7 02.6	7 11	Do.
Hydes	39 29	76 29	1897.35	5 44.7	5 59	Do.
Cockeysville	39 29	76 39	1896.74	6 02.1	6 19	Do.
Libertytown	39 29	77 14	1899.38	4 47.2	4.55	Do.
Westernport	39 29	79 02	1897.59	3 46.2	4.00	Do.
Snaggy Mountain	39 29	79 29	1897.74	3 37.2	3.51	Do.
Taylors Hill	39 30	79 30	1897.75	3 31.7	3.45	Do.
Havre de Grace	39 32	76 05	1899.47	5 24.4	5.32	Do.
Belair, Hotel	39 32	76 21	1897.08	5 41.5	5.57	Do.
Belair, Dallam	39 32	76 21	1897.36	4 37.2	4.52	Do.
McHenry	39 33	79 21	1899.43	3 36.3	3.44	Do.
Churchville	39 34	76 15	1897.35	5 43.2	5.58	Do.
Lonaconing	39 34	78 59	1898.66	3 51.0	4.01	Do.
Fikes Hill, west	39 34	79 30	1897.78	3 40.4	3.54	Do.
Fikes Hill, east	39 35	79 29	1897.77	3 40.3	3.54	Do.
Thomas Run	39 35	76 17	1897.35	5 37.8	5.52	Do.
Forest Hill	39 35	76 23	1896.85	5 24.5	5.41	Do.
Westminster	39 35	77 00	1896.77	5 06.9	5.24	Do.
Westminster, S. M.	39 35	77 00	1900.45	4 45.0	4.50	J. B. Baylor
Westminster, N. M.	39 35	77 00	1900.46	4 48.1	4.53	Do.
Elkton, S. M.	39 36	75 50	1900.44	5 21.3	5 26	Do.
Elkton, N. M.	39 36	75 50	1900.44	5 51.5	5 56	Do.
Elkton	39 36	75 50	1896.79	5 12.0	5 29	L. A. Bauer

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

MARYLAND—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group I—Continued	° ′	° ′		° ′ *West*	° ′ *West*	
Hagerstown	39 38	77 43	1896.77	4 34.2	4 51	L. A. Bauer
Hagerstown, N. M.	39 38	77 45	1900.44	4 36.7	4 41	J. A. Fleming
New Germany	39 38	79 07	1899.44	3 59.0	4 07	L. A. Bauer
Accident	39 38	79 19	1899.43	3 44.8	3 52	Do.
Dublin, (gabbro rock)	39 39	76 16	1897.37	10 00.9	10 16	L. A. Bauer
Minefield	39 39	76 22	1897.37	6 53.7	7 08	Do.
Parkton	39 39	76 40	1899.45	5 59.1	6 07	Do.
Cumberland M. L.	39 40	78 46	1897.62	4 06.4	4 20	Do.
Highland	39 40	76 22	1897.37	5 33.2	5 48	Do.
Manchester	39 40	76 53	1899.38	5 34.7	5 43	Do.
Taneytown	39 40	77 11	1899.38	4 57.8	5 06	Do.
Calvert	39 42	75 58	1899.47	5 26.0	5 34	Do.
Rising Sun	39 42	76 03	1899.47	5 08.8	5 16	Do.
Hancock	39 42	78 10	1897.57	4 24.9	4 39	Do.
Grantsville	39 42	79 09	1899.43	3 58.4	4 06	Do.
Cardiff, Peerless Quarry	39 43	76 19	1897.37	6 51.1	7 06	Do.
Cardiff, Schoolhouse	39 43	76 20	1897.37	7 27.7	7 42	Do.
Cardiff, Boundary Station	39 43	76 20	1897.37	8 35.5	8 50	Do.
Cardiff, Railroad	39 43	76 20	1896.85	4 25.9	4 42	Do.
Group II						
Monie Bay	38 13	75 54	1860.6	2 35	5 11	D. S. Hessey
Vienna	38 29	75 49	1886.6	4 50	5 42	J. W. Thompson
Ashton	39 08	77 01	1893.1	5 28	5 57	H. B. Looker
On boundary line between Allegany and Garrett counties	39 28	79 03	1898.5	3 09.1	3 20	W. M. Brown
Do.	39 30	79 03	1898.5	3 46.8	3 58	Do.
Do.	39 33	79 01	1898.5	3 54.4	4 05	Do.
Do.	39 35	79 00	1898.5	3 54.1	4 05	Do.
Do.	39 38	78 58	1898.5	4 00.2	4 11	Do.
Do.	39 40	78 57	1898.5	4 02.9	4 14	Do.
Do.	39 43	78 55	1898.5	4 04.2	4 15	Do.

MASSACHUSETTS

Group I	° ′	° ′		° ′ *West*	° ′ *West*	
Nantucket Cliff	41 17	70 06	1895.49	12 11.1	12 24	J. B. Baylor
Sampson Hill	41 23	70 29	1846.56	8 48.7	11 56	T. J. Lee
Indian	41 26	70 41	1846.61	8 49.4	11 57	Do.
Vineyard Haven	41 28	70 36	1875.72	10 34.2	11 45	J. M. Poole
Tarpaulin Cove	41 28	70 45	1846.60	9 12.1	12 19	T. J. Lee
Fairhaven	41 37	70 54	1845.80	8 54.2	12 05	Do.
Hyannis	41 38	70 18	1846.65	9 21.6	12 29	Lee & Fauntleroy
Chatham	41 40	69 57	1860.69	11 11.6	13 19	C. A. Schott
Shootflying	41 41	70 21	1846.66	9 40.3	12 48	Lee & Fauntleroy
Copecut	41 43	71 04	1844.77	9 08.8	12 24	T. J. Lee
Cromeset	41 44	70 43	1887.47	11 46	12 18	G. Bradford
Wellfleet	41 56	70 02	1860.70	10 43.5	12 52	C. A. Schott
Manomet	41 56	70 36	1867.58	10 24.6	12 05	C. O. Boutelle
Provincetown	42 03	70 11	1895.53	12 59.2	13 12	J. B. Baylor

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

MICHIGAN—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*E or W* ° ′	*E or W* ° ′	
Pontiac	42 37	83 19	1895	0 28 W	0 57 W	County surveyor
Algonac	42 37	82 32	1867.0	0 04 E	2 35 W	O. N. Chaffee
Barry County	.. ..	.. ..	1829	5 03 E	0 37 E	Mean, 16 stations
Hastings	42 38	85 18	1901	0 00	0 02 W	L. S. Cobb
Oakland County	.. ..	.. ..	1819	4 37 E	0 05 E	Mean, 21 stations
Macomb County	.. ..	.. ..	1817	4 50 E	0 02 W	Mean, 15 stations
Saugatuck	42 40	86 12	1871.6	2 22 E	0 03 E	H. Custer
Agricultural College	42 45	84 31	1901.3	0 29 W	0 32 W	H. K. Vedder
Black Leg Harbor	42 46	86 12	1871.6	2 23.5 E	0 05 E	Farquhar & Foote
Public Survey Station	42 50	84 22	1826.5	4 55 E	0 27 E	Public surveyor
Stag Island	42 53	82 27	1866.5	0 22 E	2 19 E	F. M. Towar
Grand River	42 55	86 10	1837.5	4 30 E	0 31 E	
Ottawa County	.. ..	.. ..	1835	5 32 E	1 30 E	Mean, 18 stations
Ionia County	.. ..	.. ..	1895	0 30 E	0 01 E	County surveyor
Clinton County	.. ..	.. ..	1831	3 50 E	0 34 W	Mean, 14 stations
Shiawassee County	.. ..	.. ..	1824	3 21 E	1 08 W	Mean, 7 stations
St. Clair County	.. ..	.. ..	1821	4 41 E	0 10 W	Mean, 18 stations
Fort Gratiot	43 00	82 25	1873.5	0 37 W	2 47 W	A. N. Lee
Public Survey Station	43 00	84 22	1831.5	3 27 E	0 57 W	Public surveyor
Genesee County	.. ..	.. ..	1823	3 41 E	0 49 W	Mean, 7 stations
Kent County	.. ..	.. ..	1837	4 23 E	0 03 E	Mean, 24 stations
2 m. south of Lakeport	43 05	82 28	1859.8	0 15 W	3 24 W	W. H. Hearding
Elsie	43 06	84 25	1901.2	0 35 W	0 38 W	Charles Eddy
Lapeer County	.. ..	.. ..	1826	4 39 E	0 06 W	Mean, 17 stations
4 m. south of Lexington	43 12	82 30	1859.8	0 36 W	3 45 W	W. H. Hearding
Muskegon	43 13	86 19	1871.5	4 02 E	1 43 E	L. Foote
1 m. south of Lexington	43 15	82 31	1859.6	1 00 W	4 09 W	W. H. Hearding
1 m. north of Lexington	43 16	82 31	1859.7	1 21 W	4 30 W	Do.
Muskegon County	.. ..	.. ..	1838	4 19 E	0 20 E	Mean, 20 stations
Montcalm County	.. ..	.. ..	1839	3 33 E	0 38 W	Mean, 19 stations
Gratiot County	.. ..	.. ..	1831	3 08 E	1 16 W	Mean, 13 stations
Public Survey Station	43 19	85 59	1837.5	6 15 E	2 15 E	Public surveyor
3 m. S. of New London Pt.	43 20	82 31	1858.8	1 14 W	4 26 W	W. H. Hearding
Public Survey Station	43 20	84 22	1832.5	3 00 E	1 22 W	Public surveyor
Saginaw County	.. ..	.. ..	1827	3 12 E	1 16 W	Mean, 17 stations
Wahley	43 22	82 32	1860.4	1 05.0 W	4 11 W	W. P. Smith
Whitehall	43 22	86 25	1871.5	4 02.5 E	1 43 E	Farquhar & Foote
New London Point	43 23	82 31	1858.8	0 43 W	3 55 W	W. H. Hearding
St. Louis	43 24	84 36	1876.8	0 58.6 E	0 57 W	D. W. Lockwood
Sanilac County	.. ..	.. ..	1833	3 07 E	1 26 W	Mean, 31 stations
Port Sanilac	43 25	82 32	1858.7	0 30 W	3 43 W	W. H. Hearding
Saginaw	43 25	83 58	1876.7	0 23.4 E	1 33 W	D. W. Lockwood
Tuscola County	.. ..	.. ..	1835	3 50 E	0 27 W	Mean, 22 stations
Fremont	43 28	85 58	1872	1 45 E	0 30 W	W. S. Merrill
Miller Creek	43 28	82 33	1858.7	0 43 W	3 56 W	W. H. Hearding
Cherry Creek	43 30	82 34	1858.6	0 42 W	3 55 W	Do.
Little Point aux Sables	43 31	85 54	1837.5	6 00 E	2 00 E	
Newaygo County	.. ..	.. ..	1830	3 35 E	0 57 W	Mean, 24 stations
Benona	43 34	86 30	1870.6	4 56 E	2 33 E	J. W. Cuyler
Mount Pleasant	43 36	84 47	1895	0 30 W	0 59 W	County surveyor
Elk Creek	43 37	82 35	1858.6	0 35 W	3 48 W	W. H. Hearding
3 m. W. of Quamakissee R.	43 37	83 43	1857.7	1 32 E	1 44 W	Do.
Oceana County	.. ..	.. ..	1839	4 48 E	0 50 E	Mean, 18 stations
Mecosta County	.. ..	.. ..	1841	4 08 E	0 02 E	Mean, 15 stations
Isabella County	.. ..	.. ..	1839	3 21 E	0 50 W	Do.

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

MICHIGAN—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*E* or *W* ° ′	*E* or *W* ° ′	
Midland County	.. ..	.. ..	1832	3 11 E	1 11 W	Mean, 11 stations
Saginaw River, mouth	43 39	83 50	1856.5	1 28 E	1 52 W	W. H. Hearding
Forestville	43 40	82 34	1873.5	1 30.7 W	3 41 W	A. N. Lee
4 m. NW. of Saginaw River	43 41	83 55	1856.5	1 28 E	1 52 W	W. H. Hearding
Big Rapids	43 42	85 28	1900.7	0 27 E	0 21 E	L. W. June
White Rock Point	43 43	82 36	1858.6	0 21 W	3 34 W	W. H. Hearding
Bay County	.. ..	.. ..	1839	2 29 E	1 42 W	Mean, 16 stations
Père Marquette River	43 44	85 43	1837.5	4 34 E	0 14 E	
Public Survey Station	43 45	84 22	1832.5	2 55 E	1 27 W	Public surveyor
Nyahquing Point	43 46	83 56	1856.5	1 14 E	2 06 W	W. H. Hearding
Sharpe Bay	43 47	82 36	1858.5	0 18 W	3 31 W	Do.
Pentwater	43 47	86 25	1895	1 45 E	1 16 E	H. A. Grant
Cranes Point	43 50	82 38	1858.5	0 16 W	3 30 W	W. H. Hearding
Harbor Beach, south end	43 50	82 38	1901.5	2 34.8 W	2 37 W	T. Russell
Harbor Beach, middle	43 51	82 38	1901.5	2 41.5 W	2 44 W	Do.
South of Point aux Barques	43 51	82 42	1835.5	1 38 E	2 51 W	
20 m. W. of Pt. aux Barques	43 51	83 06	1835.5	2 06 E	2 23 W	
Huron County	.. ..	.. ..	1835	2 39 E	1 50 W	Mean, 31 stations
Stony Island	43 52	83 26	1857.5	0 24 E	2 54 W	W. H. Hearding
Forest Bay	43 53	82 40	1858.5	0 03 E	3 11 W	Do.
Sand Point	43 55	83 23	1858.7	0 32 E	2 41 W	W. P. Smith
Stafford	43 57	82 42	1858.5	0 12 W	3 26 W	W. H. Hearding
Père Marquette	43 57	86 27	1871.6	4 18 E	2 00 E	F. U. Farquhar
Standish	43 58	83 59	1895	2 00 W	2 29 W	County surveyor
Arenac County	.. ..	.. ..	1844	2 18 E	1 47 W	Mean, 15 stations
Gladwin County	.. ..	.. ..	1850	2 41 E	1 00 W	Mean, 12 stations
Clare County	.. ..	.. ..	1847	3 39 E	0 11 W	Mean, 15 stations
Osceola County	.. ..	.. ..	1842	3 37 E	0 26 W	Mean, 16 stations
Lake County	.. ..	.. ..	1839	3 37 E	0 21 W	Mean, 15 stations
Mason County	.. ..	.. ..	1938	5 18 E	1 19 E	Mean, 17 stations
Oak Point, near	43 59	83 12	1857.7	1 05 E	2 12 E	W. H. Hearding
Pointe aux Gres	43 59	83 40	1857.7	1 30 E	1 47 E	G. W. Lamson
Little Lake Sable	43 59	86 28	1866.7	4 12 E	1 34 E	A. F. Chaffee
2 m. north of Stafford	44 00	82 45	1858.5	0 08 E	3 06 W	W. H. Hearding
Pt. aux Barques L. H., near	44 00	82 46	1858.5	0 05 E	3 09 W	Do.
Partridge River	44 00	83 03	1857.6	0 08 E	3 09 W	G. W. Lamson
Hat Point	44 00	83 06	1857.7	0 40 E	2 37 W	Do.
Pointe aux Barques	44 01	82 47	1857.5	0 00.4 W	3 18 W	
Willow River	44 02	82 50	1857.4	0 12 W	3 30 W	W. H. Hearding
Gravelly Point	44 03	83 34	1857.7	1 25 E	1 52 W	G. W. Lamson
Point aux Barques	44 04	82 57	1857.5	0 00	3 18 W	W. H. Hearding
6 m. N. of White Stone Pt.	44 12	83 33	1857.5	0 34 E	2 44 W	G. W. Lamson
Cadillac	44 14	85 25	1881	0 22 E	1 12 W	County surveyor
Manistee	44 15	86 20	1900.6	1 30 E	1 24 E	S. H. Baker
Manistee County	.. ..	.. ..	1842	3 54 E	0 02 E	Mean, 18 stations
4 m. north of Tawas Point	44 18	83 24	1856.5	2 05 E	1 17 W	G. W. Lamson
Wexford County	.. ..	.. ..	1844	3 10 E	0 38 W	Mean, 17 stations
Missaukee County	.. ..	.. ..	1851	3 48 E	0 10 E	Mean, 16 stations
Roscommon County	.. ..	.. ..	1847	3 00 E	0 50 W	Do.
Ogemaw County	.. ..	. ..	1845	2 31 E	1 24 W	Do.
Iosco County	.. ..	.. ..	1844	1 50 E	2 15 W	Mean, 21 stations
Au Sable	44 24	83 19	1901.5	1 24.0 W	1 26 W	T. Russell
Sable River	44 25	83 19	1856.5	2 12 E	1 10 W	W. H. Hearding
North Bar Lake	44 29	86 15	1866.7	3 16 E	0 38 E	O. N. Chaffee
Geological Station	44 31	83 50	1838.5	2 00 E	2 27 W	

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

MICHIGAN—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*E or W* ° ′	*E or W* ° ′	
Drummond I. near Harbor I.	45 55	83 34	1859.5	0 50 W	4 28 W	W. H. Hearding
Seul Choix Point	45 55	85 55	1855.7	3 56.0 E	0 04 E	Do.
Goose Island	45 56	84 26	1896.7	1 07.9 W	1 36 W	T. Russell
Drummond I., S. side	45 56	83 38	1859.6	0 26 W	4 04 W	W. H. Hearding
Drummond I., SW. point	45 56	83 42	1859.6	0 13 E	3 25 W	Do.
Drummond I., E. side	45 57	83 29	1859.5	0 26 E	3 12 W	Do.
Scott Point	45 57	85 41	1855.5	3 06 E	0 47 W	Do.
Manistique River	45 57	86 10	1864.5	3 06 E	0 09 W	W. T. Casgrain
Point au Barque	45 57	86 20	1864.5	3 28 E	0 13 E	Do.
Manistique	45 58	86 13	1897.8	0 15.2 E	0 05 W	T. Russell
Point Brulee	45 58	84 32	1849.7	1 24 E	2 50 W	E. P. Scammon
Do.	45 58	84 33	1849.7	1 10 E	3 04 W	Do.
Isle St. Martin	45 58	84 35	1849.6	0 32 E	3 42 W	Do.
Grosse Point	45 58	84 41	1849.6	2 00 E	2 14 W	Do.
Point Patterson	45 58	85 39	1854.5	2 51 E	1 05 W	G. W. Lamson
Search Bay, Pt. St. Martin	45 59	84 31	1849.7	0 47.5 E	3 26 W	E. P. Scammon
Point St. Martin	45 59	84 32	1849.6	0 59 E	3 15 W	Do.
Point Brulee	45 59	84 34	1849.7	1 14.5 E	2 59 W	Do.
Drummond Island	45 59	83 53	1897.7	3 48.3 W	4 09 W	T. Russell
Search Bay	46 00	84 30	1849.7	0 40 E	3 34 W	E. P. Scammon
Detour	46 00	83 55	1897.7	3 50.8 W	4 11 W	T. Russell
Point Brulee	46 00	84 32	1849.7	1 15 E	2 59 W	E. P. Scammon
Mackinac County	.. ..	.. ..	1845	2 58 E	1 27 W	Mean, 23 stations
East of Boiling Spring Pt.	46 02	84 35	1849.6	1 32 E	2 42 W	E. P. Scammon
Sault Island	46 02	83 45	1854.5	1 23 W	5 19 W	Do.
Boiling Spring Point	46.02	84 38	1849.6	1 59 E	2 15 W	Do.
Pointe Epoufette	46 04	85 07	1854.7	2 30.0 E	1 26 W	Chart
Robinson	46 04	84 25	1896.6	1 31.0 W	1 59 W	T. Russell
Lime Island	46 06	84 00	1897.7	3 50.9 W	4 11 W	Do.
Naubinway	46 07	85 33	1897.8	0 03.4 W	0 24 W	Do.
Maple Hill	46 09	84 47	1896.6	0 54.3 W	1 22 W	Do.
Schoolcraft County	.. ..	.. ..	1845	4 12 E	0 13 W	Mean, 2 stations
Twin Island, Mud Lake	46 12	84 06	1854.5	2 37 W	6 30 W	E. P. Scammon
W. Neebish Rapids	46 18	84 12	1854.5	2 03 W	5 59 W	Do.
Neebish Island, N. end	46 20	84 11	1897.6	3 29.1 W	3 50 W	T. Russell
Chippewa County	.. ..	.. ..	1845	1 33 E	2 52 W	Mean, 17 stations
Alger County	.. ..	.. ..	1845	4 18 E	0 07 W	Mean, 8 stations
Round Island	46 27	84 31	1896.6	2 04.9 W	2 33 W	G. E. Balch
Salt Point	46 28	84 52	1896.5	2 08.6 W	2 38 W	Do.
Grand Island, S. end	46 28	86 40	1859.7	4 13 E	0 35 E	G. W. Lamson
Laughing Fish River	46 28	86 55	1867.5	5 00 E	1 58 E	H. Gillman
Sugar Island Rapids	46 29	84 18	1854.5	0 17 E	3 39 W	E. P. Scammon
Soo ◬	46 29	84 21	1895.4	1 51.3 W	2 24 W	C. S. Riché
Point Iroquois	46 29	84 38	1896.5	1 34.1 W	2 02 W	G. E. Balch
Sault Ste. Marie	46 30	84 20	1895.3	2 16.5 W	2 50 W	C. S. Riché
Sugar Island, NE. side	46 30	84 08	1853.5	0 40 E	3 20 W	E. P. Scammon
Chocolate River	46 30	87 20	1867.6	5 25 E	2 24 E	H. Gillman
Shot Point	46 31	87 10	1867.6	5 19 E	2 18 E	Do.
Small River	46 32	87 10	1824.5	7 21 E	2 28 E	H. W. Bayfield
Grand Island, near L. H.	46 34	86 40	1867.7	3 06 E	0 05 E	O. B. Wheeler
Sec. 14, T. 48 N., R. 38 W.	46 35	89 01	1883.1	3 20 E	1 39 E	C. S. Woodard
Little Girl Point	46 37	90 17	1868.6	8 00 E	5 04 E	H. Gillman
Granite Point	46 39	87 27	1866.5	3 04 E	0 02 W	A. Molitor
Black River	46 40	90 02	1868.5	7 50 E	4 53 E	H. Gillman
Grand Marais	46 41	85 57	1867.7	2 02 E	0 59 W	Chart

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

MICHIGAN—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*E or W* ° ′	*E or W* ° ′	
Pine Cliff	46 42	85 53	1867.7	2 01 E	1 00 W	O. B. Wheeler
Crisp △, near	46 44	85 15	1895.5	0 22.7 W	0 56 W	T. Russell
Whitefish Point	46 46	84 57	1895.8	1 49.5 W	2 20 W	Do.
Lone Rock, n'r Porcupine Mt	46 48	89 49	1868.5	11 30 E	8 41 E	J. E. Griffith
Point on shore	46 48	90 01	1824.5	10 15 E	6 00 E	H. W. Bayfield
Little Iron River	46 49	87 35	1866.6	4 21 E	1 15 E	A. Molitor
Iron River	46 50	89 34	1868.4	6 48 E	4 00 E	J. E. Griffith
Ontonagon	46 51	89 20	1895	3 00 E	2 25 E	County surveyor
Keweenaw Bay	46 52	88 28	1864.7	4 55 E	1 51 E	H. Gillman
Huron River	46 55	88 07	1824.5	7 56 E	3 41 E	H. W. Bayfield
Portage Entry	46 59	88 25	1863.5	4 37 E	1 29 E	J. U. Mueller
Misery River	47 00	88 59	1865.6	7 43 E	4 43 E	H. Gillman
Torch Bay	47 05	88 26	1863.5	3 41 E	0 33 E	J. U. Mueller
Point above Elm River	47 05	88 55	1865.6	6 41 E	3 41 E	H. Gillman
Dollar Bay	47 07	88 29	1863.5	4 03 E	0 55 E	J. U. Mueller
Salmon Trout River	47 09	88 45	1865.6	7 41 E	4 41 E	H. Gillman
2 m. N. of Traverse Point	47 11	88 15	1865.6	3 55 E	0 55 E	A. Molitor
Torch Lake	47 12	88 24	1864.6	5 11 E	2 07 E	H. Gillman
Portage Lake, N. end	47 13	88 36	1863.5	4 33 E	1 25 E	J. U. Mueller
Isabella Point	47 21	87 56	1865.4	4 53 E	1 52 E	A. Molitor
Gratiot River	47 21	88 27	1865.5	7 37 E	4 37 E	H. Gillman
West of Eagle River	47 23	88 21	1855.5	6 12 E	2 36 E	W. F. Raynolds
Eagle River	47 25	88 17	1855.5	6 46 E	3 10 E	Do.
Copper Harbor	47 28	87 51	1873.6	4 03.3 E	1 37 E	A. N. Lee
Agate Harbor	47 28	88 03	1855.5	5 20 E	1 44 E	W. F. Raynolds
Eagle Harbor	47 28	88 08	1855.5	2 40 E	0 56 W	J. U. Mueller
Isle Royale, S. shore	47 50	89 06	1868.5	4 56 E	2 07 E	B. D. Greene
Isle Royale, Washington H.	47 53	89 13	1868.5	6 36 E	3 47 E	A. C. Lamson
Isle Royale, Siskawit Point	47 54	88 54	1868.5	4 30 E	1 41 E	B. D. Greene
Isle Royale, Wright Island	47 58	88 49	1868.5	4 16 E	1 27 E	Do.
Isle Royale, Todd Harbor	48 05	88 45	1868.5	6 30 E	3 41 E	J. C. Mallery
Isle Royale, Fish Island	48 09	88 37	1867.5	5 08 E	2 16 E	A. C. Lamson
Isle Royale, Scoville Point	48 10	88 26	1867.5	6 28 E	3 36 E	B. D. Greene

MINNESOTA

Group I	° ′	° ′		*East* ° ′	*East* ° ′	
Heron Lake	43 49	95 18	1900.79	8 58.2	8 53	J. W. Miller
Mantorville	44 05	92 46	1900.81	6 23.1	6 18	Do.
Mankato	44 11	93 59	1900.80	8 59.5	8 54	Do.
Watopa	44 14	92 02	1893.6	7 14.1	6 36	W. R. Hoag
Lake Benton	44 17	96 18	1900.79	9 15.9	9 10	J. W. Miller
Lake City	44 23	92 08	1893.66	7 02.2	6 25	W. R. Hoag
Buck Hill	44 43	93 17	1893.47	8 17.2	7 39	Do.
Marcotta	44 49	93 03	1893.47	8 33.7	7 56	Do.
Granite Falls	44 50	95 33	1900.78	8 56.2	8 51	J. W. Miller
Fort Snelling	44 54	93 11	1880.74	10 13.7	8 37	J. B. Baylor
Wallace	44 54	93 05	1893.48	10 11.0	9 33	W. R. Hoag
Woodbury	44 55	92 57	1893.47	8 30.4	7 52	Do.
Hopkins	44 55	93 27	1893.45	8 12.3	7 34	Do.
St. Paul	44 58	93 05	1891.63	9 21.4	8 35	J. B. Baylor

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

MINNESOTA—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group I—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Prospect Park	44 58	93 13	1893.43	8 58.9	8 21	W. R. Hoag
Ramsey	44 59	93 00	1893.46	10 00.1	9 22	Do.
Minneapolis, Univ. grounds	44 59	93 14	1891.59	9 04.9	8 18	G. R. Putnam
St. Paul, Snelling ave. N. B.	45 00	93 10	1900.82	8 41.4	8 36	J. W. Miller
Mound View	45 06	93 10	1893.46	9 07.5	8 30	W. R. Hoag
Benson	45 20	95 36	1900.70	9 23.3	9 18	J. W. Miller
St. Cloud	45 35	94 11	1900.75	9 08.4	9 03	Do.
Alexandria	45 55	95 24	1900.77	10 37.7	10 32	Do.
Breckenridge	46 17	96 35	1900.70	12 01.7	11 56	Do.
Brainerd	46 21	94 13	1900.74	7 44.4	7 38	Do.
Wadena	46 28	95 09	1900.73	9 25.7	9 20	Do.
Duluth	46 46	92 04	1891.65	12 46.9	11 58	J. B. Baylor
Detroit City	46 50	95 52	1900.72	10 20.2	10 14	J. W. Miller
Glyndon	46 52	96 35	1900.71	10 04.5	9 58	Do.
Walker	47 07	94 36	1900.74	9 50.7	9 44	Do.
Crookston	47 49	96 37	1900.71	10 52.2	10 46	Do.
Group II						
Rock County	.. ..	.. ..	1866	11 21	9 03	Mean, 6 stations
Nobles County	.. ..	.. ..	1868	11 11	8 59	Mean, 9 stations
Jackson County	.. ..	.. ..	1858	11 41	9 05	Do.
Martin County	.. ..	.. ..	1855	10 30	7 49	Mean, 8 stations
Welcome	43 41	94 35	1894	8 50	8 16	County surveyor
Faribault County	.. ..	.. ..	1854	12 27	9 44	Mean, 9 stations
Freeborn County	.. ..	.. ..	1854	9 55	7 12	Mean, 11 stations
Mower County	.. ..	.. ..	1853	8 30	5 46	Mean, 10 stations
Houston County	.. ..	.. ..	1854	7 54	5 11	Mean, 8 stations
Fillmore County	.. ..	.. ..	1853	9 43	6 59	Mean, 12 stations
Fountain	43 44	92 08	1895	7 10	6 41	County surveyor
Windom	43 52	95 04	1896	9 22	8 57	Do.
Cottonwood County	.. ..	.. ..	1859	11 32	8 57	Mean, 7 stations
St. James	43 59	94 37	1894	9 25	8 51	Otto Klose
Watonwan County	.. ..	.. ..	1856	10 26	7 46	Mean, 5 stations
Pipestone County	.. ..	.. ..	1869	11 56	9 47	Mean, 4 stations
Murray County	.. ..	.. ..	1864	11 40	9 18	Mean, 6 stations
Blue Earth County	.. ..	.. ..	1854	11 12	8 29	Do.
Waseca County	.. ..	.. ..	1854	11 32	8 49	Do.
Steele County	.. ..	.. ..	1854	9 18	6 35	Mean, 4 stations
Dodge County	.. ..	.. ..	1854	8 35	5 52	Do.
Olmsted County	.. ..	.. ..	1854	9 21	6 38	Mean, 7 stations
Winona County	.. ..	.. ..	1854	8 25	5 42	Mean, 6 stations
Watonwan County	44 02	94 40	1901.2	9 12	9 08	Otto Klose
Do.	44 03	94 26	1900.8	8 25	8 20	Do.
Wabasha County	.. ..	.. ..	1855	9 41	7 00	Mean, 6 stations
Wabasha	44 18	92 02	1876.6	8 04.3	6 19	T. N. Bailey
Brown County	.. ..	.. ..	1858	10 22	7 46	Mean, 3 stations
New Ulm	44 19	94 26	1895	8 27	7 58	County surveyor
Nicollet County	.. ..	.. ..	1854	11 03	8 20	Mean, 6 stations
Lesueur County	.. ..	.. ..	1854	11 47	9 04	Mean, 3 stations
Rice County	.. ..	.. ..	1854	9 25	6 42	Mean, 5 stations
Goodhue County	.. ..	.. ..	1855	9 04	6 23	Mean, 10 stations
Redwood County	.. ..	.. ..	1861	10 31	8 01	Mean, 8 stations
Lyon County	.. ..	.. ..	1863	12 00	9 35	Mean, 6 stations
Lincoln County	.. ..	.. ..	1871	12 08	10 05	Do.

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

MINNESOTA—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		East ° ′	East ° ′	
Henderson	44 32	93 56	1855.5	11 30	8 49	J. S. Allanson
Sibley County	.. ..	.. ..	1853	10 37	7 53	Mean, 11 stations
Red Wing	44 34	92 32	1895	6 15	5 46	County surveyor
Scott County	.. ..	.. ..	1854	11 08	8 25	Mean, 6 stations
Renville County	.. ..	.. ..	1858	11 19	8 43	Mean, 9 stations
Yellow Medicine County	.. ..	.. ..	1866	11 32	9 15	Mean, 8 stations
Dakota County	.. ..	.. ..	1853	9 29	6 45	Mean, 6 stations
McLeod County	.. ..	.. ..	1856	11 33	8 53	Do.
Carver County, average	.. ..	.. ..	1899	9 33	9 19	County surveyors
Kandiyohi County	44 53	94 49	1894.8	8 38	8 06	B. F. Jenness
Washington County	.. ..	.. ..	1847	9 03	6 11	1 station
Ramsey County	.. ..	.. ..	1847	11 00	8 08	Mean, 4 stations
Hennepin County	.. ..	.. ..	1854	11 04	8 21	Mean, 7 stations
Chippewa County	.. ..	.. ..	1862	11 33	9 05	Mean, 5 stations
Kandiyohi County	45 04	95 06	1900.1	8 44	8 35	B. F. Jenness
Lac qui Parle County	.. ..	.. ..	1868	12 08	9 56	Mean, 6 stations
Bellingham	45 08	96 15	1901.1	9 45	9 41	George Michel
Meeker County	.. ..	.. ..	1856	11 21	8 41	Mean, 8 stations
Kandiyohi County	.. ..	.. ..	1857	10 16	7 38	Mean, 6 stations
Do.	45 10	94 59	1900.6	8 06	8 00	B. F. Jenness
Do.	45 15	95 10	1894.8	9 08	8 36	Do.
Wright County	.. ..	.. ..	1856	11 29	8 49	Mean, 7 stations
Anoka County	.. ..	.. ..	1852	11 37	8 51	Mean, 11 stations
Swift County	.. ..	.. ..	1865	11 34	9 14	Mean, 7 stations
Ortonville	45 18	96 24	1895	10 50	10 21	County surveyor
Bigstone County	.. ..	.. ..	1869	13 00	10 51	Mean, 7 stations
Sherburne County	.. ..	.. ..	1854	10 08	7 25	Mean, 6 stations
Chisago County	.. ..	.. ..	1851	12 03	9 15	Do.
Isanti County	.. ..	.. ..	1856	11 40	9 00	Mean, 14 stations
Stearns County	.. ..	.. ..	1857	10 57	8 19	Do.
Princeton	45 33	93 33	1858.6	10 13	7 37	O. E. Garrison
Pope County	.. ..	.. ..	1860	11 05	8 32	Mean, 4 stations
Stevens County	.. ..	.. ..	1867	11 26	9 11	Do.
Morris	45 36	95 54	1885	10 46	9 34	County surveyor
Collegeville	45 36	94 19	1901.2	7 58	7 54	A. Ortman
Foley	45 39	93 53	1895	9 10	8 41	County surveyor
Benton County	.. ..	.. ..	1853	10 46	8 02	Mean, 12 stations
Glenwood	45 40	95 21	1890	11 58	11 06	County surveyor
Traverse County	.. ..	.. ..	1870	12 14	10 08	Mean, 6 stations
Millelacs County	.. ..	.. ..	1857	10 31	7 53	Mean, 17 stations
Barrett	45 55	95 52	1900.9	10 10	10 05	C. G. Gustafzan
Grant County	.. ..	.. ..	1866	12 36	10 19	Mean, 5 stations
Douglas County	.. ..	.. ..	1861	12 50	10 20	Mean, 7 stations
Kanabec County	.. ..	.. ..	1855	11 27	8 46	Mean, 15 stations
Morrison County	.. ..	.. ..	1855	10 53	8 12	Mean, 24 stations
Todd County	.. ..	.. ..	1859	11 14	8 39	Mean, 9 stations
Pine County	.. ..	.. ..	1859	12 06	9 31	Mean, 21 stations
Wilkin County	.. ..	.. ..	1867	13 09	10 54	Mean, 6 stations
Cass County, south	.. ..	.. ..	1868	10 30	8 18	Mean, 15 stations
Henning	46 19	95 23	1896	10 05	9 40	County surveyor
Ottertail County	.. ..	.. ..	1868	11 58	9 38	Mean, 15 stations
Wadena County	.. ..	.. ..	1867	11 12	8 49	Mean, 6 stations
Carlton County	.. ..	.. ..	1868	9 54	7 34	Mean, 16 stations
Aitkin County	.. ..	.. ..	1869	10 05	7 48	Mean, 42 stations
Crow Wing County	.. ..	.. ..	1861	12 16	9 36	Mean, 18 stations

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

MINNESOTA—Continued

Station	Latitude	Longitude	Date of observation.	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Fond du Lac	46 39	92 15	1861.7	9 42	7 03	W. H. Hearding
Spirit Lake	46 41	92 11	1861.6	9 46	7 07	Do.
Minnesota Point, near S. Base	46 43	92 02	1861.5	10 12	7 32	Do.
St. Louis Bay	46 43	92 10	1861.6	11 44	9 05	Do.
Minnesota Point, S. Base	46 44	92 03	1870.8	9 46	7 33	E. S. Wheeler
Sabin	46 48	96 38	1901.1	10 30	10 26	C. P. Jones, jr.
Clay County	.. ..	.. ..	1869	12 50	10 33	Mean, 8 stations
Lester River	46 50	92 00	1861.5	7 39	5 00	H. C. Penny
Becker County	.. ..	.. ..	1872	12 03	9 56	Mean, 11 stations
Knife River	46 57	91 46	1861.6	12 45	10 05	H. C. Penny
Hubbard County	.. ..	.. ..	1875	11 31	9 35	Mean, 6 stations
St. Louis County, southeast	.. ..	.. ..	1871	9 05	6 54	Mean, 24 stations
St. Louis County, southwest	.. ..	.. ..	1876	9 14	7 21	Mean, 30 stations
Ada	47 19	96 30	1898.7	11 08	10 52	G. T. Hawkins,
Norman County	.. ..	.. ..	1874	12 49	10 49	Mean, 14 stations
Itasca County, southeast	.. ..	.. ..	1875	9 40	7 44	Mean, 43 stations
Cass County, north	.. ..	.. ..	1872	10 40	8 33	Mean, 11 stations
Point on shore	47 33	90 50	1824.5	10 30	6 58	H. W. Bayfield
Itasca County, southwest	.. ..	.. ..	1875	10 45	8 49	Mean, 3 stations
Lake County	.. ..	.. ..	1882	8 34	7 03	Mean, 27 stations
Beltrami County, south	.. ..	.. ..	1889	10 45	9 46	Mean, 48 stations
Terrace Point	47 43	90 26	1868.6	8 12	5 46	H. Gilliman
Brulé River	47 48	90 03	1868.6	9 30	7 04	W. E. Rogers
Cook County	.. ..	.. ..	1881	7 50	6 15	Mean, 24 stations
Polk County	.. ..	.. ..	1877	12 11	10 22	Mean, 31 stations
Grand Portage Island	47 57	89 39	1868.6	5 50	3 24	W. E. Rogers
North shore Lake Superior	47 58	90 00	1823.5	6 21	3 00	S. H. Long
Pigeon Point	48 00	89 30	1868.5	9 30	7 04	W. E. Rogers
St. Louis County, northeast	.. ..	.. ..	1884	8 09	6 48	Mean, 18 stations
St. Louis County, northwest	.. ..	.. ..	1886	8 26	7 14	Mean, 29 stations
Warren	48 12	96 47	1898.7	11 26	11 10	G. T. Hawkins
Marshall County	.. ..	.. ..	1900	11 30	11 23	J. K. Wood
Itasca County, northeast	.. ..	.. ..	1887	8 47	7 39	Mean, 18 stations
Itasca County, northwest	.. ..	.. ..	1887	9 41	8 33	Mean, 14 stations
Marshall County, east	.. ..	.. ..	1881	12 09	10 35	Mean, 4 stations
Marshall County, west	.. ..	.. ..	1872	13 50	11 43	Mean, 7 stations
Island in Rainy Lake	48 35	92 30	1823.5	8 15	5 10	S. H. Long
Hallock	48 45	96 46	1898.7	11 37	11 21	G. T. Hawkins
Kittson County	.. ..	.. ..	1874	13 16	11 20	Mean, 11 stations
Roseau County	.. ..	.. ..	1886	11 43	10 31	Mean, 19 stations
Beltrami County, north	.. ..	.. ..	1892	9 47	9 02	Mean, 23 stations
Lake of the Woods	49 00	94 00	1823.5	11 01	8 11	S. H. Long
Northwest Boundary	49 00	94 45	1874.1	10 55	8 54	W. J. Twining
Do.	49 00	94 55	1874.1	11 05	9 04	Do.
Do.	49 00	95 00	1874.1	11 12	9 11	Do.
Lake of the Woods, Buf'lo Pt.	49 00	95 15	1874	11 30	9 29	Do.
Northwest Boundary	49 00	96 10	1874	12 00	9 59	Do.
Do.	49 00	96 25	1874	12 25	10 24	Do.
Do.	49 00	96 30	1874	13 10	11 09	Do.

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued

MISSISSIPPI

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group I	° ′	° ′		*East* ° ′	*East* ° ′	
Shieldsboro	30 18	89 19	1896.14	5 12.1	4 52	J. B. Baylor
East Pascagoula	30 21	88 33	1855.07	7 08.9	4 49	J. E. Hilgard
Mississippi City	30 23	89 02	1896.12	4 57.0	4 36	J. B. Baylor
Poplarville	30 50	89 30	1896.12	5 20.9	5 00	Do.
Natchez	31 34	91 24	1890.33	6 29.8	5 49	Do.
Brookhaven	31 35	90 27	1901.24	5 32.5	5 30	W. Weinrich
Ellisville	31 37	89 12	1901.27	4 54.4	4 52	Do.
Jackson	32 20	90 11	1901.23	5 57.0	5 54	Do.
Vicksburg	32 21	90 53	1890.34	6 21.0	5 40	J. B. Baylor
Forest	32 22	89 28	1901.25	5 25.6	5 23	W. Weinrich
Meridian	32 23	88 44	1901.26	4 44.6	4 42	Do.
Yazoo City	32 51	90 21	1901.22	5 27.6	5 25	Do.
Greenville	33 25	91 04	1890.36	6 18.0	5 37	J. B. Baylor
Winona	33 30	89 43	1901.21	5 08.7	5 06	W. Weinrich
West Point	33 36	88 39	1901.20	4 42.3	4 40	Do.
Tupelo	34 16	88 43	1901.18	4 27.4	4 24	Do.
Oxford	34 22	89 32	1901.18	5 31.8	5 29	Do.
Holly Springs	34 47	89 26	1901.16	5 30.6	5 28	Do.
Group II						
Ship Island	30 13	88 58	1841.5	7 35	4 56	L. M. Powell
Cat Island	30 15	89 06	1847.5	7 12	4 39	—— Barnett
Pascagoula	30 21	88 33	1875.4	6 19.5	4 50	J. M. Poole
Long Beach	30 22	89 04	1895	4 52	4 29	County surveyor
Hancock County	.. ..	.. ..	1841	7 20	4 41	Mean, 8 stations
Harrison County	.. ..	.. ..	1842	7 24	4 46	Mean, 5 stations
Jackson County	.. ..	.. ..	1845	7 25	4 50	Mean, 8 stations
Pearl River County	.. ..	.. ..	1893	5 20	4 50	County surveyor
Liberty	31 09	90 44	1895	6 30	6 07	Do.
Amite County	.. ..	.. ..	1843	8 07	5 30	Mean, 19 stations
Wilkinson County	.. ..	.. ..	1848	8 07	5 35	Mean, 16 stations
Greene County	.. ..	.. ..	1817	8 00	5 22	Mean, 15 stations
Perry County	.. ..	.. ..	1813	8 00	5 26	Mean, 34 stations
Marion County	.. ..	.. ..	1827	8 07	6 22	Mean, 39 stations
Pike County	.. ..	.. ..	1810	8 44	6 14	Mean, 20 stations
Do.	31 13	90 19	1900.2	5 55	5 49	J. T. Burke
McComb	31 15	90 22	1901	6 00	5 58	I. A. Quin
Franklin County	.. ..	.. ..	1848	8 56	6 24	Mean, 16 stations
Roxie	31 30	91 00	1900.7	6 00	5 55	R. A. Rhodes
Lincoln County	.. ..	.. ..	1810	8 45	6 15	Mean, 14 stations
Adams County	.. ..	.. ..	1846	8 10	5 36	Mean, 6 stations
Natchez	31 34	91 24	1901	6 15	6 13	S. M. Dalgom
Lawrence County	.. ..	.. ..	1810	8 29	5 59	Mean, 19 stations
Covington County	.. ..	.. ..	1841	8 20	5 41	Do.
Jones County	.. ..	.. ..	1895	5 00	4 37	County surveyor
Wayne County	.. ..	.. ..	1817	8 05	5 27	Mean, 6 stations
Jefferson County	.. ..	.. ..	1848	8 10	5 38	Mean, 9 stations
Simpson County	.. ..	.. ..	1896	5 18	4 59	County surveyor
Claiborne County	.. ..	.. ..	1846	8 23	5 49	Mean, 6 stations
Do.	32 02	90 45	1899.8	5 40	5 32	F. A. Polsley
Smith County	.. ..	.. ..	1832	7 58	5 13	Mean, 19 stations
Jasper County	.. ..	.. ..	1832	7 50	5 05	Mean, 20 stations
Clarke County	.. ..	.. ..	1833	7 48	5 04	Do.
Kings Point	32 20	90 56	1877?	7 20	5 56	Chart

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued

MISSISSIPPI—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued.	° ′	° ′		*East* ° ′	*East* ° ′	
Vicksburg	32 21	90 53	1900.5	5 56	5 51	W. L. Polk
Warren County	.. ..	.. ..	1847	8 23	5 50	Mean, 2 stations
Lauderdale County	.. ..	.. ..	1833	7 35	4 51	Mean, 21 stations
Scott County	.. ..	.. ..	1832	8 00	5 15	Mean, 19 stations
Near boundary of Rankin and Scott counties	32 24	89 48	1892.2	6 16.6	5 42	R. E. Buckley
Newton County	.. ..	.. ..	1831	7 43	4 58	Mean, 17 stations
Decatur	32 26	89 01	1895	5 12	4 49	County surveyor
Madison County	.. ..	.. ..	1832	8 14	5 29	Mean, 3 stations
Leake County	.. ..	.. ..	1834	8 13	5 29	Mean, 16 stations
Neshoba County	.. ..	.. ..	1833	7 57	5 13	Mean, 14 stations
Kemper County	.. ..	.. ..	1834	7 06	4 22	Mean, 24 stations
Scooba	32 50	88 30	1833.5	6 55	4 11	
Yazoo County	.. ..	.. ..	1837	8 00	5 18	1 station
Couparle	32 53	89 45	1901	6 01	5 59	B. F. Cotten
Madison-Leake counties	.. ..	.. ..	1901	5 31	5 29	Do.
Sharkey County	.. ..	.. ..	1837	8 00	5 18	Mean, 2 stations
Coopwood	32 59	88 55	1901.6	4 59	4 58	F. M. Shields
Kosciusko	33 04	89 30	1900	5 15	5 08	C. C. Comfort
Attala County	.. ..	.. ..	1833	8 00	5 16	Mean, 22 stations
Holmes County	.. ..	.. ..	1833	7 56	5 12	Mean, 11 stations
Louisville	33 08	88 57	1901	5 12	5 10	F. M. Shields
Winston County	.. ..	.. ..	1833	7 42	4 58	Mean, 17 stations
Noxubee County	.. ..	.. ..	1833	7 27	4 43	Mean, 20 stations
Macon	33 08	88 38	1833.5	7 30	4 46	G. W. Campbell
Choctaw County	.. ..	.. ..	1832	7 56	5 11	Mean, 11 stations
Oktibbeha County	.. ..	.. ..	1832	7 25	4 40	Mean, 12 stations
Carroll County	.. ..	.. ..	1832	7 57	5 12	Mean, 15 stations
Montgomery County	.. ..	.. ..	1833	8 06	5 22	Mean, 12 stations
Lowndes County	.. ..	.. ..	1834	7 38	4 52	Mean, 10 stations
Leflore County	.. ..	.. ..	1833	8 02	5 18	Mean, 19 stations
Clay County	.. ..	.. ..	1835	7 46	5 03	Do.
Webster County	.. ..	.. ..	1836	7 52	5 09	Mean, 13 stations
Sunflower County	.. ..	.. ..	1836	8 11	5 28	Mean, 15 stations
Grenada County	.. ..	.. ..	1833	7 49	5 05	Mean, 14 stations
Grenada	33 47	89 50	1872.2	6 25.1	4 46	T. C. Hilgard
Bolivar County	.. ..	.. ..	1833	8 15	5 31	Mean, 17 stations
Chickasaw County	.. ..	.. ..	1834	7 18	4 34	Mean, 14 stations
Monroe County	.. ..	.. ..	1836	7 29	4 46	Mean, 12 stations
Wren	33 58	88 36	1883.7	4 45	3 42	G. G. Tindall
Calhoun County	.. ..	.. ..	1835	7 45	5 02	Mean, 18 stations
Tallahatchie County	.. ..	.. ..	1835	8 00	5 17	Mean, 17 stations
Yalobusha County	.. ..	.. ..	1834	8 07	5 23	Mean, 14 stations
Coahoma County	.. ..	.. ..	1836	8 12	5 29	Mean, 28 stations
Pontotoc County	.. ..	.. ..	1834	7 13	4 29	Mean, 14 stations
Itawamba County	.. ..	.. ..	1835	7 12	4 29	Do.
Lee County	.. ..	.. ..	1834	7 20	4 36	Mean, 10 stations
Quitman County	.. ..	.. ..	1842	8 06	5 28	Mean, 11 stations
Panola County	.. ..	.. ..	1836	7 52	5 09	Mean, 22 stations
Lafayette County	.. ..	.. ..	1834	7 43	4 59	Do.
Union County	.. ..	.. ..	1834	7 20	4 36	Mean, 9 stations
Tate County	.. ..	.. ..	1835	8 17	5 34	Mean, 8 stations
Tunica County	.. ..	.. ..	1836	8 07	5 24	Mean, 20 stations
Prentiss County	.. ..	.. ..	1835	7 28	4 45	Mean, 9 stations

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

MISSISSIPPI—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Burtons	34 40	88 14	1900	5 30	5 25	J. E. Lacy
Tishomingo County	.. ..	.. ..	1835	6 46	4 03	Mean, 20 stations
Marshall County	.. ..	.. ..	1834	7 58	5 14	Mean, 24 stations
Tippah County	.. ..	.. ..	1834	7 28	4 44	Mean, 11 stations
Benton County	.. ..	.. ..	1834	7 30	4 46	Mean, 14 stations
Ashland	34 50	89 05	1896	4 40	4 21	County surveyor
De Soto County	.. ..	.. ..	1835	8 00	5 17	Mean, 14 stations
Alcorn County	.. ..	.. ..	1835	7 18	4 35	Mean, 11 stations
Corinth	34 56	88 35	1875.4	6 21.6	4 52	F. E. Hilgard

MISSOURI

Group I	° ′	° ′		*East* ° ′	*East* ° ′	
Cape Girardeau	37 18	89 33	1865.21	6 35	4 23	A. T. Mosman
Ironton	37 37	90 38	1890.87	2 12.5	1 29	C. H. Sinclair
Wittenberg	37 39	89 33	1865.26	6 47	4 35	A. T. Mosman
Potosi	37 56	90 47	1890.89	6 06	5 22	C. H. Sinclair
Versailles, North Base	38 30	92 48	1897.41	6 35	6 17	A. L. Baldwin
St. Louis	38 38	90 16	1900.92	5 04.4	5 00	W. F. Wallis
Harrisonville	38 39	94 18	1900.89	7 42.6	7 38	Do.
Sedalia	38 43	93 14	1900.89	7 35.3	7 31	Do.
Hermann	38 43	91 25	1900.91	6 26.1	6 22	Do.
Kansas City	39 06	94 33	1900.83	8 58.2	8 54	Do.
Macon	39 45	92 27	1900.81	6 59.0	6 54	Do.
Chillicothe	39 47	93 33	1900.82	7 01.9	6 57	Do.
Palmyra	39 48	91 32	1900.80	6 21.9	6 17	Do.
Lancaster	40 31	92 31	1900.79	7 28.0	7 23	Do.
Group II						
Pemiscot County	.. ..	.. ..	1895	5 17	4 51	W. W. Tensley
Gatewood	36 32	91 03	1880.5	7 11.8	5 51	F. E. Nipher
Cedar Creek	36 37	92 59	1895	6 10	5 44	H. W. Strahan
Doniphan	36 38	90 47	1894	5 30	5 01	County surveyor
McDonald County	.. ..	.. ..	1823	10 36	8 30	Boundary survey
Public Survey Station	36 40	90 02	1825.5	8 00	5 17	Public surveyor
Barry County	.. ..	.. ..	1823	9 40	7 34	Boundary survey
Poplar Bluffs	36 44	90 22	1880.5	6 44.7	5 24	F. E. Nipher
Cape Fair	36 45	93 30	1895	5 30	5 04	County surveyor
Stone County	36 49	93 29	1901	5 47	5 44	D. S. McCullough
Mississippi County	36 50	89 10	1900.5	4 22	4 16	F. H. Wright
Public Survey Station	36 50	90 02	1823.5	7 30	4 40	Public surveyor
Stoddard County	.. ..	.. ..	1895	5 00	4 34	County surveyor
Newton County	.. ..	.. ..	1823	10 30	8 24	Boundary survey
Charleston	36 56	89 19	1880.5	5 43.2	4 22	F. E. Nipher
Howell County	36 56	91 55	1880.6	7 31.3	6 11	Do.
Public Survey Station	37 00	90 02	1823.5	8 00	5 10	Public surveyor
Do.	37 00	90 12	1823.5	8 00	5 10	Do.
Piedmont	37 08	90 41	1880.5	7 22.8	6 02	F. E. Nipher
Shannon County	.. ..	.. ..	1895	5 15	4 49	T. J. Rowlett

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

MISSOURI—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Jasper County	.. ..	.. ..	1823	10 30	8 24	Boundary survey
Springfield	37 16	93 15	1879.7	8 35.8	7 16	F. E. Nipher
Hartville	37 16	92 27	1895	7 30	7 04	County surveyor
Wright County	.. ..	.. ..	1901.0	5 10	5 06	W. C. Mings
Houston	37 19	91 55	1880.6	7 34.9	6 14	F. E. Nipher
Lutesville	37 20	89 59	1880.5	6 13.9	4 53	Do.
Madison County	.. ..	.. ..	1901	4 30	4 27	C. Graham
Greenfield	37 25	93 51	1901.2	5 44	5 41	B. F. Thomas
Reynolds County	.. ..	.. ..	1901	4 30	4 27	H. L. Sutterfield
Public Survey Station	37 30	90 02	1827.5	7 30	4 45	Public surveyor
Barton County	.. ..	.. ..	1823	10 15	8 09	Boundary survey
West Fork	37 31	91 07	1895	5 30	5 04	County surveyor
Farm of F. Voris	37 36	93 11	1881.6	8 08.8	6 54	F. E. Nipher
Arcadia	37 36	90 41	1880.5	6 48.7	5 27	Do.
Pilot Knob, base	37 37	90 37	1880.6	11 08.4	9 48	Do.
Pilot Knob, top	37 37	90 37	1880.6	3 45.4	2 24	Do.
Bolivar	37 37	93 24	1881.6	8 14.6	7 00	Do.
Buffalo	37 38	93 06	1881.6	8 07.0	6 52	Do.
Salem	37 39	91 31	1880.6	6 56.3	5 35	Do.
Lebanon	37 40	92 42	1880.6	7 46.0	6 25	Do.
Vernon County	37 40	94 15	1901.1	6 48	6 44	J. M. Clack
Perry County	.. ..	.. ..	1895	4 45	4 19	County surveyor
Perryville	37 45	89 51	1901	4 30	4 27	T. J. Killian
Vernon County	37 53	94 22	1901.2	6 55	6 52	J. M. Clack
Decaturville	37 54	92 43	1881.6	8 56.6	7 42	F. E. Nipher
Potosi	37 56	90 47	1900.7	5 00	4 55	H. Hawkins
Wheatland	37 56	93 19	1881.6	8 39.5	7 25	F. E. Nipher
Rolla	37 58	91 45	1880.5	6 53	5 32	Emerson
Hickory County	.. ..	.. ..	1901.1	5 28	5 24	Eric Eklof
Schell City	38 03	94 05	1879.6	9 02.7	7 43	F. E. Nipher
Cuba	38 04	91 21	1880.6	7 24.8	6 04	Do.
Rich Hill	38 06	94 22	1893	8 30	7 58	County surveyor
De Soto	38 07	90 35	1880.6	7 46.9	6 26	F. E. Nipher
Lawson Farm	38 11	92 11	1881.6	6 53.9	5 36	Do.
Vienna	38 12	91 54	1881.5	7 14.9	5 57	Do.
Tuscumbia	38 12	92 27	1881.6	8 30.4	7 13	Do.
Warsaw	38 14	93 23	1881.6	8 51.2	7 36	Do.
Soap Creek	38 17	92 50	1881.6	8 20.7	7 06	Do.
Dry Fork	38 17	91 35	1881.5	7 04.7	5 47	Do.
Canaan	38 20	91 25	1895	6 15	5 49	County surveyor
Kimmswick	38 20	90 26	1880.6	6 45.5	5 24	F. E. Nipher
Lincoln	38 23	93 21	1881.6	9 18.6	8 04	Do.
Roedersville	38 24	91 10	1881.5	6 55.7	5 38	Do.
Wulfert Farm	38 24	91 16	1881.5	7 04.1	5 46	Do.
Union	38 25	90 59	1881.5	6 35.7	5 18	Do.
Morgan County	.. ..	.. ..	.....	. ....	7 21	D. W. Eaton, mean of 69 results
Pacific	38 28	90 44	1881.5	6 54.1	5 36	F. E. Nipher
F. Kaldeweiher's	38 28	91 41	1882.5	7 44.3	6 30	Do.
Linn	38 28	91 50	1882.5	7 36.9	6 23	Do.
Grays Summit	38 29	90 49	1882.5	6 54.5	5 40	Do.
Washington	38 31	90 59	1881.5	6 19.1	5 01	Do.
Windsor	38 32	93 33	1881.6	8 43.5	7 28	Do.
Goebel's Station	38 34	91 06	1882.5	7 37.9	6 24	F. E. Nipher

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

MISSOURI—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Jefferson City	38 35	92 09	1881.6	8 27.2	7 10	F. E. Nipher
22 M. west of Jefferson City	38 35	92 30	1868.6	8 47	6 47	G. B. Nicholson
Newport	38 36	91 06	1882.5	6 59.0	5 45	F. E. Nipher
Kirkwood	38 36	90 24	1882.5	6 24.5	5 10	Do.
Fred Bruhn's	38 37	91 29	1882.5	6 52.4	5 38	Do.
Ten-Mile House	38 38	90 23	1881.5	6 47.5	5 30	Do.
Centertown	38 38	92 25	1881.6	7 37.9	6 20	Do.
California	38 39	92 34	1881.6	7 44.0	6 27	Do.
Cass County	.. ..	.. ..	1823	10 00	7 54	Boundary survey
Near Clayton	38 41	90 19	1881.5	6 03.7	4 46	F. E. Nipher
St. Charles rock road	38 41	90 21	1882.6	6 08.3	4 54	Do.
E. Ruck's	38 41	91 20	1882.5	7 51.1	6 37	Do.
G. Zimmerman's	38 41	93 34	1881.6	9 15.2	7 58	Do.
Marion	38 42	92 22	1881.6	7 39.3	6 22	Do.
Pattonsville	38 42	90 29	1881.7	5 53.9	4 37	Do.
Holden	38 43	94 03	1879.6	8 56.0	7 36	Do.
Dardenne	38 43	90 42	1881.7	6 32.6	5 16	Do.
Healds	38 43	90 40	1882.6	6 46.4	5 33	Do.
Little Auxvasse Creek	38 43	92 01	1882.5	7 55.4	6 41	Do.
Opposite St. Charles	38 44	90 31	1881.7	7 19.4	6 02	Do.
Warrenton, west of town	38 46	91 09	1882.6	6 33.8	5 20	Do.
Florissant	38 47	90 17	1881.7	6 35.0	5 18	Do.
O'Fallon	38 47	90 43	1880.8	6 45.4	5 25	Do.
Wright City	38 47	91 00	1878.5	8 13.6	6 46	Do.
St. Charles	38 48	90 30	1895	4 57	4 31	County surveyor
Prairie Home	38 48	92 39	1881.6	7 37.7	6 20	F. E. Nipher
Providence	38 49	92 25	1881.7	7 38.8	6 22	Do.
Johnson's Farm	38 51	92 40	1881.6	7 28.9	6 12	Do.
Swope's	38 52	93 35	1881.6	8 37.2	7 22	Do.
Danville	38 55	91 32	1881.7	7 47.7	6 31	Do.
Sweet Springs	38 55	93 29	1881.6	9 24.0	8 09	Do.
Columbia	38 56	92 19	1880.1	7 33.8	6 11	Do.
Loomis Farm	38 57	91 47	1881.7	7 46.4	6 29	Do.
Franklin	38 57	92 45	1819.5	11 42	9 05	S. H. Long
McCredie	38 58	91 55	1881.7	7 50.6	6 34	F. E. Nipher
Stephen's Store	38 58	92 05	1882.5	7 36.7	6 23	Do.
Troy	38 58	91 00	1895	5 00	4 34	County surveyor
Montgomery	39 00	91 30	1882.6	7 07.1	5 53	F. E. Nipher
Herndon	39 00	93 16	1881.6	8 55.2	7 40	Do.
Clark's Farm	39 02	92 55	1881.6	7 54.1	6 39	Do.
Arrow Rock	39 06	93 00	1881.6	7 54.0	6 39	Do.
Independence	39 06	94 25	1894.6	7 52	7 25	F. A. Jones
Marshall	39 08	93 11	1881.6	8 32.4	7 17	F. E. Nipher
Lafayette County	39 09	93 54	1900.7	5 28	5 23	B. D. Weedin
Mexico	39 11	91 52	1878.5	7 38.6	6 11	F. E. Nipher
Lexington	39 12	93 53	1896	7 35	7 14	County surveyor
Parkville	39 12	94 41	1901.3	8 43	8 40	A. M. Matloon
Centralia	39 13	92 08	1882.5	7 57.1	6 43	F. E. Nipher
Glasgow	39 13	92 50	1879.6	8 21.3	6 57	Do.
Carroll County	.. ..	.. ..	1898	8 20	8 06	S. A. Ballard
Carrollton	39 21	93 30	1879.6	8 30.0	7 06	F. E. Nipher
Long Branch of Salt River	39 22	91 59	1882.6	7 59.8	6 46	Do.
Do.	39 24	92 10	1882.5	8 06.5	6 52	Do.
Cow Island	39 25	94 00	1819.6	11 32.6	8 50	S. H. Long

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

MISSOURI—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Moberly	39 26	92 26	1882.5	7 39.6	6 26	F. E. Nipher
Louisiana	39 28	91 03	1878.6	7 07.2	5 39	Do.
Winkler's	39 35	92 00	1882.6	7 44.5	6 31	Do.
Wolford's	39 38	93 45	1882.6	8 40.0	7 30	Do.
Smith's	39 39	94 11	1882.6	9 36.5	8 26	Do.
Kingston	39 41	94 04	1882.6	9 13.3	8 03	Do.
Shelbyville, 3 miles south	39 44	92 04	1882.6	7 47.0	6 33	Do.
Hannibal	39 44	91 24	1878.6	7 08.3	5 40	Do.
St. Joseph	39 45	94 50	1895	8 39	8 14	County surveyor
Stewartsville	39 46	94 29	1896	7 47	7 26	Do.
Buchanan County	39 47	94 51	1897.7	7 48	7 32	T. Steinacker
1 mile west of Laclede	39 47	93 17	1882.5	8 10.7	7 00	F. E. Nipher
Maysville	39 48	94 24	1882.6	9 18.3	8 08	Do.
Shelbyville	39 48	92 01	1894	6 20	5 51	County surveyor
Palmyra	39 48	91 29	1901.0	6 21	6 17	C. S. Wright
Isaac Lewis's	39 48	92 37	1882.5	7 58.7	6 45	F. E. Nipher
Linneus	39 51	93 13	1882.5	7 55.9	6 46	Do.
Harris	39 53	92 22	1882.6	7 36.9	6 23	Do.
Yellow Creek, west branch	39 54	93 07	1882.5	8 16.1	7 05	Do.
Savannah	39 56	94 49	1895	8 42	8 17	County surveyor
Mercyville	39 57	92 42	1882.5	8 17.0	7 05	F. E. Nipher
La Plata	40 00	92 29	1882.6	8 09.2	6 56	Do.
Johnson's	40 01	94 23	1882.6	9 33.2	8 23	Do.
Trenton	40 03	93 39	1882.6	8 03.9	6 53	Do.
Michael's	40 04	93 53	1882.6	8 46.3	7 35	Do.
Grundy County	40 05	93 30	1901.2	7 31	7 28	L. H. Spencer
Honan's	40 08	93 56	1882.6	8 48.0	7 37	F. E. Nipher
Canton	40 09	91 31	1878.6	7 19.5	5 52	Do.
Shicklerville	40 09	92 53	1882.6	8 52.0	7 40	Do.
Kirksville	40 12	92 37	1882.6	8 16.5	7 04	Do.
Milan	40 13	93 06	1895	7 35	7 10	Charles Reeves
Amick's	40 13	93 38	1882.6	8 14.0	7 03	F. E. Nipher
Albany	40 15	94 21	1882.6	8 26.0	7 16	Do.
Bethany	40 16	94 03	1882.6	8 43.5	7 34	Do.
Sec. 15, T. 63 N., R. 30 W.	40 16	94 17	1882.6	8 33.2	7 23	Do.
Banke's	40 19	93 07	1882.6	8 37.8	7 27	Do.
Maryville	40 21	94 51	1879.6	11 13.9	9 54	Do.
Princeton	40 24	93 39	1882.6	8 47.4	7 36	Do.
Rockport	40 25	95 28	1896	10 35	10 14	County surveyor
Clark County	.. ..	.. ..	1895	6 05	5 39	O. F. Ensign
Memphis	40 27	92 13	1878.6	7 47.7	5 20	F. E. Nipher
Williams's	40 27	93 21	1882.6	8 38.8	7 28	Do.
Ward's	40 27	93 10	1882.6	8 29.1	7 18	Do.
Unionville	40 29	93 03	1882.6	8 00.7	6 50	Do.
Schuyler County	40 32	92 30	1901.0	7 40	7 36	J. H. Davis

MONTANA

Group I	° ′	° ′		*East* ° ′	*East* ° ′	
Fort Ellis	45 40	110 58	1882.66	19 35.0	18 58	B. A. Colonna
Bozeman	45 40	111 02	1896.46	18 39.6	18 28	R. L. Faris
Billings	45 47	108 30	1896.45	17 29.0	17 12	Do.

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

MONTANA—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group I—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Forsyth	46 15	106 39	1896.44	17 46.4	17 31	R. L. Faris
Townsend	46 19	111 31	1896.48	19 32.0	19 23	Do.
Miles City	46 24	105 53	1896.44	16 53.3	16 38	Do.
Helena	46 37	112 02	1896.48	19 13.8	19 05	Do.
Glendive	47 06	104 43	1896.43	16 43.9	16 29	Do.
Cascade	47 16	111 42	1896.49	19 29.8	19 21	Do.
Fort Benton	47 49	110 40	1896.50	20 35.3	20 23	Do.
Glasgow	48 12	106 37	1896.51	18.58.6	18 44	Do.
Havre	48 34	109 37	1896.51	20 19.2	20 07	Do.
Wigwam Creek	49 00	114 45	1901.68	23 19.9	23 20	O. B. French
Tobacco Plains	49 00	115 03	1901.63	23 40.2	23 40	C. H. Sinclair
Kootenay River, east	49 00	115 10	1901.76	23 38.9	23 39	O. B. French
Group II						
Beaverhead County, south	.. ..	.. ..	1882	19 36	19 07	1 station
Gallatin County, south	.. ..	.. ..	1872	19 10	18 39	Do.
Park County, south	.. ..	.. ..	1882	19 00	18 23	Do.
Head of Gallatin	45 15	111 00	1872.7	19 09	18 38	F. V. Hayden
Madison River	45 16	111 41	1860.5	19 00	18 38	W. F. Raynolds
Virginia	45 19	111 56	1895	19 15	19 03	County surveyor
Madison County, north	.. ..	.. ..	1871	19 25	18 54	Hayden
Crow Indian Reservation	.. ..	.. ..	1882	18 48	18 04	Mean, 6 stations
Beaverhead County, north	.. ..	.. ..	1868	20 30	20 00	1 station
Bozeman, near	45 40	111 02	1898	19 00	18 53	C. M. Thorpe
Powder River	45 47	105 03	1859.5	16 54	15 56	W. F. Raynolds
Mean, 3 stations	45 50	114 40	1867	19 45	19 16	L. F. Carter
Gallatin County, north	.. ..	.. ..	1872	19 20	18 49	Mean, 8 stations
Near Three Forks	45 52	111 22	1860.5	20 29	20 07	W. F. Raynolds
Silver Bow County	.. ..	.. ..	1868	20 10	19 40	1 station
Yellowstone River	45 56	108 22	1860.5	17 56	17 16	W. F. Raynolds
Rosebud River	46 03	106 23	1859.5	17 50	16 52	Do.
Ravalli County	.. ..	.. ..	1893	20 20	20 04	Mean, 10 stations
Yellowstone County, NW.	.. ..	.. ..	1883	19 13	18 38	Mean, 6 stations
Fort Sarpy	46 18	107 04	1859.5	18 00	17 02	W. F. Raynolds
Phillipsburg	46 18	113 17	1895	20 30	20 18	County surveyor
Yellowstone County, NE.	.. ..	.. ..	1881	19 23	18 45	Mean, 3 stations
Custer County	.. ..	105–106	1884	18 00	17 19	Mean, 5 stations
Custer County, west	.. ..	.. ..	1881	18 40	17 54	1 station
Fort Owen	46 31	113 58	1853.5	19 25	19 15	I. I. Stevens
Meagher County, west	.. ..	.. ..	1875	20 00	19 18	Mean, 8 stations
Fergus County, southeast	.. ..	.. ..	1882	19 42	19 05	Mean, 6 stations
Fergus County, southwest	.. ..	.. ..	1882	18 30	17 53	1 station
Hell Gate	46 52	113 59	1860.5	21 00	20 38	J. Mullan
Lewis and Clarke County	.. ..	.. ..	1873	20 43	20 12	Mean, 5 stations
Deerlodge County	.. ..	.. ..	1881	20 24	19 54	Mean, 6 stations
Missoula County, east	.. ..	.. ..	1882	22 00	21 31	Mean, 13 stations
Dawson County, southeast	.. ..	.. ..	1882	17 45	17 01	Mean, 5 stations
Cascade County, east	.. ..	.. ..	1882	20 13	19 36	Mean, 2 stations
Cascade County, west	.. ..	.. ..	1880	20 30	19 51	Mean, 3 stations
Bitter Root	47 19	115 04	1860.5	20 45	20 23	J. Mullan
Missoula County, west	.. ..	.. ..	1860	20 45	20 23	1 station
Fergus County, northeast	.. ..	.. ..	1882	19 35	18 58	Mean, 3 stations
Fergus County, northwest	.. ..	.. ..	1883	19 43	19 06	Mean, 2 stations
Belt	47 23	110 56	1894	19 56	19 39	County surveyor

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

MONTANA—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		East ° ′	East ° ′	
Greatfalls	47 29	111 16	1892	20 00	19 39	County surveyor
Dawson County, northeast	.. ..	.. ..	1882	17 45	17 00	Do.
Teton County, southeast	.. ..	.. ..	1892	21 10	20 52	Mean, 2 stations
Idaho Boundary	48 01	116 03	1898.5	22 18	22 12	D. L. Reaburn
Do.	48 06	116 03	1898.6	22 25	22 19	Do.
Do.	48 11	116 03	1898.6	22 39	22 33	Do.
Choteau County	.. ..	110–111	1867	21 35	20 51	Mean, 2 stations
Idaho Boundary	48 15	116 03	1898.6	22 43	22 37	D. L. Reaburn
Do.	48 19	116 03	1898.6	22 12	22 06	Do.
Flathead County, east	.. ..	.. ..	1892	22 06	21 48	Mean, 32 stations
Valley County	.. ..	107–108	1884	20 00	19 21	Mean, 8 stations
Choteau County	.. ..	111–W.	1878	22 00	21 29	Mean, 7 stations
Do.	.. ..	108–109	1894	19 10	18 53	Mean, 4 stations
Do.	.. ..	109–110	1874	20 40	19 58	Mean, 2 stations
South crossing Kootenay	48 22	115 21	1861.5	22 16	21 53	R. W. Haig
Idaho Boundary	48 24	116 03	1898.7	22 23	22 17	D. L. Reaburn
Do.	48 29	116 03	1898.7	22 21	22 15	Do.
Valley County	.. ..	106–107	1874	20 17	19 23	Mean, 6 stations
Flathead County, west	.. ..	.. ..	1893	22 20	22 04	Mean, 8 stations
Valley County	.. ..	105–106	1873	19 50	18 55	Mean, 6 stations
Do.	.. ..	104–105	1866	18 27	17 29	Do.
Idaho Boundary	48 34	116 03	1898.7	22 38	22 32	D. L. Reaburn
Do.	48 39	116 03	1898.7	22 45	22 39	Do.
Kootenay River	48 40	115 17	1861.5	23 24	23 01	R. W. Haig
Teton County, northeast	.. ..	.. ..	1881	21 43	21 13	Mean, 5 stations
Teton County, northwest	.. ..	.. ..	1874	23 25	22 54	Do.
Idaho Boundary	48 43	116 03	1898.7	22 57	22 51	D. L. Reaburn
Do.	48 46	116 03	1898.8	22 59	22 53	Do.
Do.	48 50	116 03	1898.8	23 02	22 56	Do.
Do.	48 54	116 03	1898.8	23 03	22 57	Do.
Do.	48 58	116 03	1898.8	23 08	23 02	Do.
Camp Kootenay, east	48 59	115 10	1860.0	22 58	22 36	J. S. Harris
Northwest Boundary	49 00	104 05	1873.7	18 25	17 20	W. J. Twining
Do.	49 00	104 20	1873.7	18 50	17 47	Do.
Do.	49 00	104 30	1874.5	18 30	17 28	Do.
Do.	49 00	104 45	1873.7	18 15	17 14	Do.
Do.	49 00	105 10	1873.7	19 32	18 30	Do.
Do.	49 00	105 25	1873.8	19 56	18 57	Do.
Do.	49 00	105 30	1874.5	19 50	18 51	Do.
Do.	49 00	105 33	1873.8	19 45	18 46	Do.
Do.	49 00	105 45	1874.5	20 15	19 17	Do.
Do.	49 00	105 55	1874.5	19 50	18 53	Do.
Do.	49 00	106 05	1874.5	20 20	19 23	Do.
Do.	49 00	106 28	1874.5	20 30	19 34	Do.
Do.	49 00	106 30	1874.5	20 20	19 25	Do.
Do.	49 00	106 45	1874.6	20 10	19 16	Do.
Do.	49 00	106 50	1874.6	20 20	19 26	Do.
Do.	49 00	106 55	1874.6	20 00	19 06	Do.
Do.	49 00	107 10	1874.6	20 40	19 47	Do.
Do.	49 00	107 15	1874.6	20 10	19 17	Do.
Do.	49 00	107 30	1874.5	20 45	19 53	Do.
Do.	49 00	107 40	1874.6	20 50	19 58	Do.
Do.	49 00	107 50	1874.6	20 38	19 47	Do.
Do.	49 00	109 00	1874.5	21 00	20 11	Do.
Do.	49 00	109 40	1874.6	20 23	19 36	Do.

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

MONTANA—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Northwest Boundary	49 00	110 30	1874.5	22 00	21 16	W. J. Twining
Do.	49 00	110 45	1874.6	22 45	22 02	Do.
Do.	49 00	111 05	1874.6	22 10	21 28	Do.
Do.	49 00	111 28	1874.6	22 40	21 59	Do.
Do.	49 00	111 30	1874.6	22 25	21 45	Do.
Do.	49 00	111 35	1874.6	22 10	21 25	Do.
Do.	49 00	112 00	1874.6	22 30	21 51	Do.
Do.	49 00	112 35	1874.6	22 30	21 53	Do.
Do.	49 00	112 55	1874.6	22 32	21 56	Do.
Do.	49 00	113 00	1874.6	22 50	22 14	Do.
Do.	49 00	113 05	1874.6	23 16	22 40	Do.
Do.	49 00	113 20	1874.6	23 45	23 10	Do.
NW. B. near R. M. Divide	49 00	113 40	1874.6	23 50	23 16	Do.
NW. B. near R. M. Divide	49 00	114 00	1874.6	23 20	22 47	Do.
Camp Kishenehen	49 00	114 21	1860.0	22 58	22 36	J. S. Harris

NEBRASKA.

Group I.	° ′	° ′		*East* ° ′	*East* ° ′	
Superior	40 02	98 02	1900.62	10 17.6	10 12	W. C. Bauer
Lincoln	40 49	96 42	1900.66	10 07.6	10 02	J. W. Miller
York	40 52	97 34	1900.61	10 22.6	10 17	W. C. Bauer
Chappell	41 06	102 28	1900.81	13 44.7	13 40	W. M. Brown
Ogalalla	41 08	101 43	1900.81	13 36.4	13 32	Do.
Sidney	41 09	103 00	1900.81	13 38.3	13 34	Do.
St. Paul	41 12	98 27	1900.62	11 24.6	11 19	W. C. Bauer
Kimball	41 14	103 38	1900.82	13 44.8	13 41	W. M. Brown
Omaha	41 16	95 58	1900.65	9 27.8	9 22	Brown and Wallis
Broken Bow	41 23	99 36	1900.70	11 54.8	11 50	W. M. Brown
Schuyler	41 26	97 04	1900.61	10 42.2	10 37	Do.
Gandy	41 28	100 27	1900.72	12 12.8	12 08	Do.
Hartman	41 29	102 21	1900.80	13 28.6	13 24	Do.
Tryon	41 34	100 58	1900.72	13 14.8	13 10	Do.
Harrisburg	41 34	103 45	1900.79	14 22.1	14 18	Do.
Sections 10–11, T. 19, R. 37	41 38	101 32	1900.73	12 44.6	12 40	Do.
Bridgeport	41 40	103 05	1900.79	13 22.3	13 18	Do.
Albion	41 41	97 59	1900.61	11 01.7	10 56	Do.
Burwell	41 46	99 12	1900.66	11 52.5	11 48	Do.
Gering	41 49	103 40	1900.78	14 20.5	14 16	Do.
Bartlett	41 52	98 33	1900.65	11 17.5	11 12	Do.
Brewster	41 56	99 50	1900.71	11 18.6	11 14	Do.
Hyannis	41 59	101 46	1900.73	13 23.0	13 18	Do.
Thedford	41 59	100 31	1900.70	12 10.2	12 06	Do.
School Section 36	42 00	99 21	1900.66	11 51.0	11 46	Do.
Norfolk	42 02	97 22	1896.36	10 33.3	10 12	R. L. Faris
Mullen	42 02	101 00	1900.70	12 50.2	12 46	W. M. Brown
Alliance	42 06	102 51	1900.70	14 10.3	14 06	Do.
Neligh	42 08	98 02	1900.62	11 15.8	11 10	Do.
Hewitt	42 15	103 59	1900.78	15 06.7	15 02	Do.
Marsland	42 26	103 16	1900.77	14 13.4	14 09	Do.
Spring Lake Ranch	42 26	102 04	1900.76	13 50.5	13 46	Do.

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

NEBRASKA—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group I—Continued	° ′	° ′		° ′ East	° ′ East	
O'Neill	42 27	98 39	1900.63	11 29.2	11 24	W. M. Brown
Keystone Ranch	42 28	102 48	1900.77	13 07.4	13 03	Do.
Kennedy	42 31	100 50	1900.68	12 36.9	12 32	Do.
Ainsworth	42 33	99 52	1900.67	11 52.5	11 48	Do.
Newport	42 36	99 20	1900.63	12 06.1	12 01	Do.
Harrison	42 41	103 53	1900.77	14 47.5	14 43	Do.
Rushville	42 43	102 29	1900.75	14 10.9	14 06	Do.
Spring View	42 49	99 45	1900.67	12 10.4	12 05	Do.
Chadron	42 50	103 00	1896.37	13 58.2	13 39	R. L. Faris
Valentine	42 52	100 34	1900.68	12 33.7	12 29	W. M. Brown
Merriman	42 55	101 44	1900.75	14 15.8	14 11	Do.
Group II						
Colorado Boundary	40 04	102 03	1869.8	13 53	12 29	O. N. Chaffee
Richardson County	.. ..	.. ..	1855	12 00	9 40	Mean, 31 stations
Pawnee County	.. ..	.. ..	1856	10 19	8 00	Mean, 6 stations
Fairbury	40 08	97 08	1895	9 48	9 24	County surveyor
Jefferson County	.. ..	.. ..	1856	12 13	10 11	Mean, 8 stations
Thayer County	.. ..	.. ..	1858	12 45	10 45	Do.
Nuckolls County	.. ..	.. ..	1858	12 45	10 45	Do.
Webster County	.. ..	.. ..	1867	12 33	10 47	Mean, 12 stations
Franklin County	.. ..	.. ..	1858	13 15	11 15	Mean, 8 stations
Harlan County	.. ..	.. ..	1865	13 18	11 39	Do.
Furnas County	.. ..	.. ..	1870	14 25	12 53	Mean, 9 stations
Red Willow County	.. ..	.. ..	1870	13 12	11 40	Mean, 5 stations
Hitchcock County	.. ..	.. ..	1870	13 22	11 59	Mean, 9 stations
Dundy County	.. ..	.. ..	1870	13 53	12 30	Do.
Rock Creek	40 11	97 02	1858.6	12 06	10 06	J. H. Simpson
Big Sandy River	40 12	97 12	1858.6	13 39	11 39	Do.
Culbertson	40 13	100 49	1895	12 10	11 48	L. J. Carrington
Colorado Boundary	40 13	102 03	1869.8	13 28	12 04	O. N. Chaffee
Little Blue River	40 15	98 10	1858.6	13 43	11 43	J. H. Simpson
Gage County	.. ..	.. ..	1856	9 47	7 45	Mean, 6 stations
Beatrice	40 16	96 44	1901.2	10 53	10 50	Willis Ball
Frontier County	40 21	100 04	1901.0	11 58	11 54	W. F. Beery
Colorado Boundary	40 21	102 03	1869.8	13 43	12 19	O. N. Chaffee
Johnson County	.. ..	.. ..	1856	10 00	7 50	Mean, 7 stations
Nemaha County	.. ..	.. ..	1855	11 10	8 48	Do.
Auburn	40 24	95 49	1896	10 10	9 50	County surveyor
Holdrege	40 27	99 21	1896	12 23	12 03	Do.
Brownville	40 28	95 40	1877.5	11 15	9 53	A. H. Blaisdell
Peru	40 30	95 45	1888.4	10 09	9 20	H. W. Bouton
Elm Creek	40 30	98 30	1858.6	12 18	10 18	J. H. Simpson
Colorado Boundary	40 30	102 03	1869.8	13 49	12 25	O. N. Chaffee
Chase County	.. ..	.. ..	1870	13 46	12 22	Mean, 14 stations
Hayes County	.. ..	.. ..	1870	13 24	12 00	Do.
Frontier County	.. ..	.. ..	1870	14 13	12 49	Mean, 16 stations
Gosper County	.. ..	.. ..	1865	14 33	12 53	Mean, 8 stations
Phelps County	.. ..	.. ..	1865	13 53	12 13	Do.
Kearney County	.. ..	.. ..	1858	13 51	12.04	Do.
Saline County	.. ..	.. ..	1857	11 36	9 35	Do.
Fillmore County	.. ..	.. ..	1858	12 26	10 26	Mean, 12 stations
Clay County	.. ..	.. ..	1858	12 19	10 19	Do.
Adams County	.. ..	.. ..	1875	12 35	11 08	Mean, 16 stations

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

NEBRASKA—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Hastings	40 34	98 24	1895	10 15	9 51	County surveyor
Fort Kearney	40 38	99 03	1858.7	13 38	11 51	J. H. Simpson
Colorado Boundary	40 39	102 03	1869.8	14 00	12 36	O. N. Chaffee
Camp No. 20	40 40	99 54	1858.7	13 17	11 30	J. H. Simpson
Frontier County	40 41	100 04	1898.9	12 10	11 59	W. F. Beery
Do.	40 41	100 36	1900.7	12 10	12 05	Do.
Otoe County	.. ..	.. ..	1856	10 17	8 07	Mean, 9 stations
Nebraska City	40 42	95 52	1880.5	10 13	9 00	C. R. Suter
Lancaster County	.. ..	.. ..	1857	10 08	8 07	Mean, 14 stations
Colorado Boundary	40 47	102 03	1869.8	14 07	12 43	O. N. Chaffee
Perkins County	.. ..	.. ..	1870	13 13	11 49	Mean, 10 stations
Dawson County	.. ..	.. ..	1869	13 39	12 06	Mean, 18 stations
Buffalo County	.. ..	.. ..	1860	14 04	12 18	Mean, 16 stations
Seward County	.. ..	.. ..	1857	11 39	9 38	Mean, 12 stations
York County	.. ..	.. ..	1858	12 33	10 33	Do.
Hamilton County	.. ..	.. ..	1858	12 42	10 42	Mean, 10 stations
Hall County	.. ..	.. ..	1862	13 20	11 25	Mean, 12 stations
Grand Island	40 55	98 20	1900.2	11 30	11 23	A. C. Koenig
Colorado Boundary	40 56	102 03	1869.8	14 12	12.48	O. N. Chaffee
Platte River	40 58	100 35	1858.9	13 32	11 45	J. H. Simpson
Cass County	.. ..	.. ..	1856	10 45	8 35	Mean, 3 stations
Plattsmouth	41 00	95 53	1895	9 30	9 06	County surveyor
Colorado Boundary	41 00	102 09	1869.7	14 16	12 52	O. N. Chaffee
Do.	41 00	102 20	1869.6	14 34	13 10	Do.
Do.	41 00	102 32	1869.6	14 48	13 24	Do.
Do.	41 00	102 43	1869.6	14 30	13 07	Do.
Do.	41 00	102 55	1869.6	14 15	12 53	Do.
Do.	41 00	103 06	1869.6	14 55	13 34	Do.
Do.	41 00	103 18	1869.6	14 50	13 30	Do.
Do.	41 00	103 29	1869.6	14 31	13 12	Do.
Do.	41 00	103 41	1869.6	14 34	13 16	Do.
Do.	41 00	103 51	1869.6	14 22	13 05	Do.
Do.	41 00	104 00	1869.6	14 34	13 18	Do.
Lincoln County	.. ..	.. ..	1869	13 41	12 17	Mean, 35 stations
Camp No. 25	41 03	101 50	1858.7	13 21	11 47	J. H. Simpson
Camp No. 22	41 05	100 50	1858.7	11 05	9 31	Do.
Wyoming Boundary	41 05	104 03	1869.6	15 09	13 54	O. N. Chaffee
Polk County	41 05	97 40	1901.2	10 52	10 49	O. W. Barnes
Do.	41 07	97 33	1901.2	10 15	10 12	Do.
Sarpy County	.. ..	.. ..	1856	10 53	8 45	Mean, 5 stations
Papillion	41 10	96 01	1895	9 48	9 24	County surveyor
Merrick County	.. ..	.. ..	1858	13 15	11 15	Mean, 5 stations
North Platte	41 11	100 45	1872.8	13 07.5	11 48	T. C. Hilgard
Polk County	.. ..	.. ..	1858	12 30	10 30	Mean, 8 stations
Polk County, 6th P. M	41 11	97 20	1881.6	11 00	9 49	O. W. Barnes
Butler County	.. ..	.. ..	1857	12 02	10 01	Mean, 12 stations
Howard County	.. ..	.. ..	1862	13 56	12 13	Mean, 8 stations
Sherman County	.. ..	.. ..	1868	13 44	12 09	Mean, 12 stations
Keith County	.. ..	.. ..	1869	14 20	12 56	Mean, 13 stations
Kimball County	.. ..	.. ..	1870	15 29	14 12	Mean, 12 stations
Saunders County	.. ..	.. ..	1857	11 36	9 35	Mean, 13 stations
Wyoming Boundary	41 14	104 03	1869.6	15 05	13 50	O. N. Chaffee
Polk County, 6th P. M	41 14	97 20	1899.5	9 30	9 20	O. W. Barnes
Do.	41 17	97 20	1889.8	11 00	10 15	Do.
Douglas County	.. ..	.. ..	1856	10 53	8 43	Mean, 5 stations

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

NEBRASKA—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Wyoming Boundary	41 22	104 03	1869.6	15 28	14 13	O. N. Chaffee
North Platte River	41 23	102 15	1858.7	15 26	13 52	J. H. Simpson
Polk County, 6th P. M	41 23	97 20	1900.7	10 05	10 00	O. W. Barnes
Custer County	.. ..	.. ..	1872	13 22	11 55	Mean, 41 stations
Nance County	.. ..	.. ..	1858	13 12	11 12	Mean, 7 stations
Engineers Cantonmen	41 25	96 00	1819.7	12 58.8	10 59	S. H. Long
Columbus	41 26	97 19	1895	10 32	10 08	County surveyor
Wyoming Boundary	41 31	104 03	1869.6	15 58	14 43	O. N. Chaffee
Deuel County	.. ..	.. ..	1869	14 35	13 11	Mean, 12 stations
Cheyenne County	.. ..	.. ..	1870	15 00	13 36	Mean, 16 stations
Washington County	.. ..	.. ..	1856	10 34	8 24	Mean, 4 stations
McPherson County	.. ..	.. ..	1869	13 47	12 23	Mean, 6 stations
Arthur County	.. ..	.. ..	1869	14 21	12 57	Mean, 5 stations
Logan County	.. ..	.. ..	1869	13 36	12 11	Mean, 4 stations
Valley County	.. ..	.. ..	1867	12 18	10 42	Mean, 12 stations
Greeley County	.. ..	.. ..	1863	12 38	10 45	Mean, 8 stations
Platte County	.. ..	.. ..	1857	12 55	10 54	Mean, 13 stations
Colfax County	.. ..	.. ..	1857	12 20	10 19	Mean, 3 stations
Dodge County	.. ..	.. ..	1856	11 48	9 43	Mean, 9 stations
Banner County	.. ..	.. ..	1870	15 47	14 33	Mean, 4 stations
Ashford	41 38	103 38	1895	14 30	14 08	County surveyor
Camp Clark	41 40	103 10	1896	13 30	13 11	Do.
Wyoming Boundary	41 40	104 03	1869.6	15 44	14 34	O. N. Chaffee
Boone County	.. ..	.. ..	1858	12 42	10 42	Mean, 5 stations
Wyoming Boundary	41 48	104 03	1869.6	15 55	14 45	O. N. Chaffee
Burt County	.. ..	.. ..	1856	12 05	9 55	Mean, 8 stations
Scotts Bluff County	.. ..	.. ..	1879	15 25	14 16	Mean, 18 stations
Grant County	.. ..	.. ..	1876	13 55	12 43	Mean, 16 stations
Hooker County	.. ..	.. ..	1875	13 45	12 31	Do.
Thomas County	.. ..	.. ..	1874	13 42	12 20	Mean, 20 stations
Blaine County	.. ..	.. ..	1872	13 24	11 57	Mean, 4 stations
Loup County	.. ..	.. ..	1872	13 25	11 58	Mean, 8 stations
Garfield County	.. .	.. ..	1870	13 20	11 50	Mean, 12 stations
Wheeler County	.. ..	.. ..	1865	12 40	11 00	Do.
Madison County	.. ..	.. ..	1858	12 47	10 47	Do.
Stanton County	.. ..	.. ..	1857	12 16	10 15	Mean, 10 stations
Cuming County	.. ..	.. ..	1857	12 21	10 20	Mean, 7 stations
Wyoming Boundary	41 57	104 03	1869.7	16 06	14 56	O. N. Chaffee
North Platte River	41 58	104 00	1858.7	15 36	14 22	J. H. Simpson
Wyoming Boundary	42 06	104 03	1869.7	16 08	14 58	O. N. Chaffee
Wayne County	42 07	97 07	1900.7	10 10	10 05	R. H. Jones
Do.	.. ..	.. ..	1857	12 17	10 16	Mean, 8 stations
Antelope County	.. ..	.. ..	1858	13 05	11 05	Mean, 14 stations
Thurston County	.. ..	.. ..	1856	12 06	10 00	Mean, 9 stations
Boxbutte County	.. ..	.. ..	1880	14 35	13 30	Mean, 16 stations
Wyoming Boundary	42 15	104 03	1869.7	16 02	14 52	O. N. Chaffee
Pierce County	.. ..	.. ..	1858	12 36	10 36	Mean, 12 stations
Plainview	42 20	97 44	1895	8 43	8 19	County surveyor
Wyoming Boundary	42 23	104 03	1869.7	15 56	14 46	O. N. Chaffee
Dakota County	.. ..	.. ..	1857	12 19	10 14	Mean, 5 stations
Rock County	.. ..	.. ..	1865	13 45	12 06	Mean, 7 stations
Brown County	.. ..	.. ..	1874	13 35	12 12	Mean, 28 stations
Holt County	.. ..	.. ..	1865	13 39	12 00	Mean, 31 stations
Dixon County	.. ..	.. ..	1857	12 36	10 26	Mean, 3 stations
Sioux County	.. ..	.. ..	1882	15 20	14 26	Mean, 34 stations

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

NEBRASKA—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		East ° ′	East ° ′	
Sheridan County	.. ..	.. ..	1881	14 48	13 46	Mean, 29 stations
Cherry County, E.	.. ..	.. ..	1875	13 35	12 21	Mean, 24 stations
Cherry County, W.	.. ..	.. ..	1880	14 35	13 21	Mean, 30 stations
Wyoming Boundary	42 32	104 03	1869.7	15 44	14 34	O. N. Chaffee
Niobrara River	42 34	103 57	1877.7	15 27.2	14 27	W. S. Stanton
Cedar County	.. ..	.. ..	1858	12 12	10 12	Mean, 12 stations
Knox County	.. ..	.. ..	1858	13 16	11 16	Mean, 13 stations
Wyoming Boundary	42 39	104 03	1869.7	15 37	14 27	O. N. Chaffee
Soldiers Creek	42 40	103 28	1877.8	15 30.0	14 25	W. S. Stanton
Dawes County	.. ..	.. ..	1882	15 13	14 13	Mean, 41 stations
Wyoming Boundary	42 48	104 03	1869.7	15 53	14 43	O. N. Chaffee
Keyapaha County	.. ..	.. ..	1872	14 07	12 40	Mean, 2 stations
Wyoming Boundary	42 56	104 03	1869.7	15 53	14 43	O. N. Chaffee
Indian Creek	42 59	104 03	1877.8	16 39.0	15 40	W. S. Stanton
South Dakota Boundary	43 00	103 59	1874.7	16 00	14 58	C. Wiltse
Do.	43 00	103 47	1874.7	15 52	14 49	Do.
Do.	43 00	103 35	1874.7	15 42	14 38	Do.
Do.	43 00	103 24	1874.7	15 32	14 28	Do.
Do.	43 00	103 12	1874.7	15 22	14 17	Do.
Do.	43 00	103 00	1874.7	15 13	14 07	Do.
Do.	43 00	102 48	1874.7	15 00	13 53	Do.
Do.	43 00	102 36	1874.7	14 50	13 42	Do.
Do.	43 00	102 25	1874.7	14 38	13 30	Do.
Do.	43 00	102 13	1874.7	14 36	13 27	Do.
Do.	43 00	102 01	1874.7	14 33	13 23	Do.
Do.	43 00	101 49	1874.7	14 30	13 19	Do.
Do.	43 00	101 37	1874.7	14 33	13 21	Do.
Do.	43 00	101 26	1874.7	14 33	13 21	Do.
Do.	43 00	101 14	1874.7	14 30	13 17	Do.
Do.	43 00	101 02	1874.7	14 26	13 12	Do.
Do.	43 00	100 50	1874.7	14 25	13 10	Do.
Do.	43 00	100 38	1874.7	14 23	13 07	Do.
Do.	43 00	100 27	1874.7	14 24	13 07	Do.
Do.	43 00	100 15	1874.7	14 15	12 58	Do.
Do.	43 00	100 03	1874.7	13 50	12 32	Do.
Do.	43 00	99 51	1874.7	13 50	12 31	Do.
Do.	43 00	99 39	1874.7	13 50	12 30	Do.

NEVADA

Group I	° ′	° ′		East ° ′	East ° ′	
T_{142}, T_{141}, Von Schmidt 35° E. Lat. Pier	35 01	114 40	1899.13	14 12	14 10	F. W. Edmonds
T_{139}, T_{138}, T_{135}, T_{135}—T_{134}	35 08	114 49	1899.14	14 42	14 40	Do.
T_{133}, T_{132}, T_{130}	35 21	115 05	1899.15	14 37	14 35	Do.
T_{125}, T_{124}, T_{122}, T_{121}	35 41	115 30	1899.18	14 56	14 54	Do.
T_{120}, T_{119}, T_{117}, T_{116}	35 51	115 42	1899.18	15 03	15 01	Do.
T_{115}, T_{114}, T_{113}, T_{112}, T_{111}	36 00	115 54	1899.19	15 06	15 04	Do.
T_{110}, T_{109}, T_{108}, T_{107}	36 09	116 05	1899.19	15 13	15 11	Do.
T_{106}, T_{104}, T_{103}, T_{102}	36 20	116 19	1899.20	15 10	15 08	Do.
T_{101}, T_{100}, T_{99}, T_{98}	36 30	116 33	1899.21	15 23	15 21	Do.

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

NEVADA—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group I—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
T_{98}, T_{97}, T_{96}, T_{95}, T_{94}	36 40	116 45	1895.77	15 40	15 36	A. W. Cuddeback
T_{92}, T_{91}, T_{90}	36 55	117 06	1895.70	16 10	16 06	Do.
T_{89}, T_{88}, T_{85}, T_{84}	37 06	117 20	1895.73	16 08	16 04	Do.
T_{83}, T_{82}, T_{80}, T_{79}, T_{78}	37 19	117 38	1895.63	16 20	16 16	Do.
T_{77}, T_{76}, T_{75}, T_{74}, T_{73}	37 29	117 51	1895.60	16 19	16 15	Do.
T_{72}, T_{71}, T_{70}, T_{69}, T_{68}	37 35	118 00	1895.59	16 29	16 25	Do.
$T_{67\frac{1}{2}}$, T_{67}, T_{66}, T_{65}, T_{64}	37 42	118 09	1895.54	16 13	16 09	Do.
T_{63}, T_{62}, T_{61}, T_{60}, T_{59}	37 49	118 19	1895.50	16 43	16 39	Do.
T_{58}, Nev.-Cal. Boundary	37 56	118 29	1894.86	13 42	13 38	Sinclair & Mather
Pioche	37 59	114 03	1883.74	17 10.9	16 49	Eimbeck & Bird
T_{46}, T_{48}, T_{49}, T_{50}, T_{53}	38 05	118 41	1894.86	16 24	16 20	Sinclair & Mather
T_{39}, T_{40}, T_{43}, T_{44}, T_{45}	38 15	118 56	1894.84	15 57	15 53	Do.
White Pine	38 19	115 30	1881.88	16 04.1	15 48	Eimbeck & Marr
T_{33}, T_{34}, T_{35}, T_{36}, T_{37}, T_{38}	38 25	119 09	1894.82	16 30	16 26	Sinclair & Mather
T_{28}, T_{29}, T_{30}, T_{31}, T_{32}	38 34	119 22	1894.78	16 33	16 29	Do.
T_{22}, T_{23}, T_{24}, T_{25}, T_{27}	38 42	119 33	1894.76	17 15	17 11	Do.
T_{15}, T_{16}, T_{17}, T_{18}, T_{19}, T_{20}	38 48	119 42	1894.71	16 20	16 16	Do.
T_8, T_9, T_{10}, T_{11}, T_{12}, T_{13}, T_{14}	38 51	119 47	1894.68	16 53	16 49	Do.
Initial 1894, T_1, T_3, T_4, T_5, T_6, and T_7	38 56	119 55	1894.65	16 28	16 24	Do.
Wheeler Peak	38 59	114 19	1882.89	16 30.4	16 08	Eimbeck & Marr
Tres Pinos	39 00	114 14	1882.92	16 22.7	16 01	Do.
Genoa	39 00	119 50	1889.59	16 44.3	16 42	R. A. Marr
Lehman's ranch	39 01	114 08	1882.94	16 16.5	15 54	Eimbeck & Marr
Carson City	39 10	119 46	1895.85	16 36.9	16 36	C. H. Sinclair
Austin	39 29	117 04	1881.41	16 57.0	16 48	Eimbeck & Marr
Reno	39 30	119 49	1881.28	17 48.7	17 49	Do.
Verdi	39 31	119 59	1889.53	17 26.7	17 25	R. A. Marr
Eureka, town	39 31	115 58	1881.38	16 36.6	16 21	Eimbeck & Marr
Diamond Peak	39 35	115 49	1881.70	16 49.7	16 34	Do.
Mount Callahan	39 43	116 57	1881.53	17 04.0	16 55	Do.
Hot Springs	39 47	118 56	1881.29	17 26.6	17 24	Do.
Mineral Hill	40 10	116 12	1881.39	17 03.2	16 54	Do.
Rye Patch	40 26	118 18	1881.30	17 49.7	17 47	Do.
Battle Mountain	40 40	116 50	1881.31	17 34.8	17 26	Do.
Elko	40 47	115 46	1881.32	17 30.8	17 15	Do.
Winnemucca	40 59	117 44	1881.30	17 38.8	17 30	Do.
Wells Station	41 07	114 56	1881.32	17 21.8	17 06	Do.
Tecoma	41 20	114 06	1881.33	17 28.2	17 12	Do.
Group II						
Lincoln County, S. point	.. ..	.. ..	1878	15 22	15 10	Mean, 4 stations
Vegas Wash	36 07	114 40	1869.5	16 01.1	15 50	Wheeler, Lockwood
Stone Ferry	36 08	114 25	1875.6	14 58.1	14 46	E. Bergland
Rio Virgin, mouth	36 09	114 22	1869.5	15 47.2	15 36	Wheeler, Lockwood
Las Vegas Range	36 11	115 03	1869.5	15 08.2	14 57	Do.
Eastern Boundary	36 20	114 03	1871.1	14 05	13 54	J. E. James
Lincoln County, southeast	.. ..	.. ..	1877	15 34	15 22	Mean, 15 stations
Lincoln County, southwest	.. ..	.. ..	1878	15 46	15 34	Mean, 17 stations
St. Thomas	36 27	114 19	1869.5	15 47.5	15 36	Wheeler, Lockwood
Indian Spring	36 34	115 35	1869.5	15 41.5	15 28	G. W. Wheeler

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

NEVADA—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
West Point	36 41	114 34	1869.5	15 19.0	15 00	Wheeler, Lockwood
Eastern Boundary	36 41	114 03	1871.1	15 02	14 43	J. E. James
Do.	37 03	114 03	1871.1	14 59	14 40	Do.
Mud Spring	37 11	115 35	1869.5	16 02.8	15 50	Wheeler, Lockwood
Mormon Canyon	37 16	114 28	1869.5	16 34.5	16 16	Do.
Eastern Boundary	37 25	114 03	1871.1	15 16	14 57	J. E. James
Lincoln County, middle east	.. ..	.. ..	1881	16 20	16 00	Mean, 13 stations
Lincoln County, middle west	.. ..	.. ..	1870	16 08	15 55	Mean, 6 stations
Clover Valley	37 30	114 14	1869.5	14 25.3	14 06	Wheeler, Lockwood
Schafer Spring	37 34	115 27	1869.5	16 10.8	15 58	D. W. Lockwood
Spring below Panacea	37 46	114 27	1869.5	16 58.8	16 40	G. W. Wheeler
Silver Peak	37 46	117 36	1890	16 08	16 02	County surveyor
Esmeralda County, south	.. ..	.. ..	1877	16 25	16 25	Mean, 9 stations
Eastern Boundary	37 47	114 03	1871.0	15 48	15 29	J. E. James
Rose Valley	37 55	114 16.	1869.5	17 50.1	17 31	Wheeler, Lockwood
Pioche	37 55	114 27	1892	16 00	15 48	County surveyor
Quinn Canyon	37 58	115 45	1869.5	16 20.2	16 07	Wheeler, Lockwood
Homer	38 03	114.10	1869.5	17 40.4	17 21	G. W. Wheeler
Eastern Boundary	38 09	114 03	1871.0	15 39	15 20	J. E. James
Esmeralda County, middle	.. ..	.. ..	1883	17 00	16 57	Mean, 7 stations
Sheep Range	38 14	114 22	1869.5	16 46.4	16 27	G. W. Wheeler
Wild Hop Creek	38 23	114 30	1869.5	15 59.5	15 40	Do.
Lincoln County, north	.. ..	.. ..	1874	16 10	15 46	Mean, 20 stations
Eastern Boundary	38 31	114 03	1871.0	16 00	15 40	J. E. James
Hawthorne	38 32	118 35	1887	16 28	16 24	County surveyor
Nye County, northeast	.. ..	.. ..	1875	16 25	16 20	Mean, 8 stations
Nye County, middle north	.. ..	.. ..	1874	16 05	16 00	Mean, 17 stations
Nye County, northwest	.. ..	.. ..	1875	16 35	16 30	Mean, 15 stations
Esmeralda County, north	.. ..	.. ..	1880	16 46	16 44	Mean, 19 stations
Cave Valley	38 39	114 49	1869.5	16 16.2	15 56	Wheeler, Lockwood
Benson Creek	38 41	114 38	1869.5	16 24.0	16 04	G. W. Wheeler
Clear Creek	38 50	114 25	1869.5	16 26.7	16 07	Do.
Eastern Boundary	38 52	114 03	1871.0	16 00	15 40	J. E. James
Dead Horse Well	38 54	118 23	1876.5	16 30.1	16 30	Engineer officer
Douglas County	.. ..	.. ..	1869	16 14	16 24	Mean, 13 stations
Rattlesnake Spring	38 57	114 26	1869.5	16 17.9	16 00	Wheeler, Lockwood
McMahon Ranch	38 59	117 28	1876.5	15 41.3	15 34	Engineer officer
Genoa	38 59	119 40	1877.5	16 47	16 52	J. N. Macomb
Ice Creek	39 02	114 49	1869.5	16 35.1	16 15	Wheeler, Lockwood
Glenbrook Wharf	39 05	119 56	1876.5	15 59	16 04	Engineer officer
White Pine County, SE.	.. ..	.. ..	1871	16 30	16 10	Mean, 17 stations
Ormsby County	.. ..	.. ..	1865	16 13	16 33	Mean, 4 stations
Big Bend, Walker River	39 09	118 56	1859.6	16 56	17 20	J. H. Simpson
Sacramento District	39 10	114 23	1869.5	16 27.4	16 07	G. W. Wheeler
Lyon County	.. ..	.. ..	1868	16 42	16 57	Mean, 18 stations
Monte Christo Mill	39 13	115 35	1869.5	17 05.1	16 52	Wheeler & Robert
Eastern Boundary	39 14	114 03	1870.9	16 00	15 40	J. E. James

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

NEVADA—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		° ′ *East*	° ′ *East*	
Murray Creek	39 15	114 51	1869.5	16 35.3	16 22	Wheeler, Lockwood
Near Hamilton	39 16	115 26	1869.5	16 43.5	16 30	Wheeler & Robert
Center Station	39 16	119 40	1876.5	16 30	16 36	Engineer officer
West'n Bndry; mean, 14 sta.	39 19	120 00	1872.8	16 50	17 00	A.W.VonSchmidt
Carson Lake	39 24	118 38	1859.6	17 11	17 35	J. H. Simpson
White Pine County, SW.	.. ..	.. ..	1872	16 34	16 20	Mean, 29 stations
Storey County	.. ..	.. ..	1861	16 35	17 00	Mean, 3 stations
Antelope Springs	39 26	115 27	1869.5	17 00.4	16 47	Wheeler, Lockwood
Piermont	39 29	114 31	1872.5	16 47	16 27	R. L. Hoxie
Patterson Ranch	39 31	117 45	1876.5	16 27.4	16 20	Engineer officer
West'n Bndry; mean, 13 sta.	39 31	120 00	1872.8	16 29	16 39	A.W.VonSchmidt
Churchill County, east	.. ..	.. ..	1872	17 30	17 35	Mean, 6 stations
Churchill County, west	.. ..	.. ..	1875	17 20	17 23	Do.
Lander County, south	.. ..	.. ..	1874	16 42	16 36	Mean, 97 stations
Eureka County, south	.. ..	.. ..	1879	16 37	16 28	Mean, 15 stations
Eastern Boundary	39 36	114 03	1870.9	16 22	16 02	J. E. James
Washoe County, south	.. ..	.. ..	1868	16 55	17 10	Mean, 40 stations
West'n Bndry; mean, 15 sta.	39 43	120 00	1872.8	16 42	16 52	A.W.VonSchmidt
Kobah Valley	39 44	116 10	1858.9	16 44	16 50	J. H. Simpson
White Pine County, NE.	.. ..	.. ..	1868	16 42	16 25	Mean, 8 stations
Antelope Valley	39 47	114 12	1859.5	16 47	16 35	J. H. Simpson
Slough, Long Valley	39 50	115 24	1869.5	16 59.9	16 47	Wheeler, Lockwood
Eagan Canyon	39 52	114 58	1859.5	16 47	16 45	J. H. Simpson
White Pine County, NW.	.. ..	.. ..	1868	16 46	16 34	Mean, 18 stations
Cho-keep Pass	39 54	115 45	1858.9	17 02	17 00	J. H. Simpson
West'n Bndry; mean, 15 sta.	39 57	120 00	1872.8	16 57	17 07	A.W.VonSchmidt
Eastern Boundary	39 58	114 03	1870.9	16 35	16 15	J. E. James
Huntingdon Springs	40 01	115 19	1859.5	18 06	18 04	J. H. Simpson
Camp Ruby	40 04	115 31	1869.5	17 09.1	16 56	Wheeler & Robert
Cold Spring	40 04	115 42	1869.5	17 12.4	16 59	G. W. Wheeler
West'n Bndry; mean, 15 sta.	40 12	120 00	1872.8	16 28	16 38	A.W.VonSchmidt
Pearl Creek	40 17	115 44	1869.5	16 18.8	16 06	Wheeler, Lockwood
Eastern Boundary	40 20	114 03	1870.9	16 52	16 32	J. E. James
West'n Bndry; mean, 15 sta.	40 25	120 00	1872.8	17 20	17 30	A.W.VonSchmidt
Willow Creek	40 31	115 44	1869.5	17 27.1	17 14	Wheeler, Lockwood
Lander County, north	.. ..	.. ..	1870	17 35	17 32	Mean, 95 stations
Eureka County, north	.. ..	.. ..	1873	16 53	16 48	Mean, 9 stations
Humboldt County, SE.	.. ..	.. ..	1874	17 44	17 48	Mean, 22 stations
Humboldt County, SW.	.. ..	.. ..	1880	17 25	17 23	Mean, 13 stations
Washoe County, middle	.. ..	.. ..	1882	17 36	17 36	Mean, 4 stations
Elko County, southeast	.. ..	.. ..	1881	17 00	16 44	Mean, 12 stations
Elko County, southwest	.. ..	.. ..	1880	17 30	17 14	Mean, 2 stations
West'n Bndry; mean, 15 sta.	40 38	120 00	1872.8	18 45	18 55	A.W.VonSchmidt
Eastern Boundary	40 42	114 03	1870.8	17 05	16 45	J. E. James
Crescent Station	40 45	115 40	1869.5	17 52	17 39	G. W. Wheeler
Camp Halleck	40 49	115 20	1869.5	16 21.4	16 08	Wheeler & Robert
Elko County, mid. S.	.. ..	.. ..	1880	16 50	16 34	Mean, 12 stations
West'n Bndry; mean, 15 sta.	40 51	120 00	1872.8	18 49	18 59	A W.VonSchmidt
Eastern Boundary	41 03	114 03	1870.8	16 59	16 39	J. E. James
West'n Bndry; mean, 15 sta.	41 04	120 00	1872.8	17 57	18 07	A.W.VonSchmidt
Elko County, mid. N.	.. ..	.. ..	1887	17 30	17 16	Mean, 16 stations

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

NEVADA—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		° ′ *East*	° ′ *East*	
West'n Bndry; mean, 15 sta.	41 17	120 00	1872.8	17 37	17 47	A. W. Von Schmidt
Eastern Boundary	41 25	114 03	1870.8	17 12	16 52	J. E. James
Washoe County, N.	.. ..	.. ..	1878	18 26	18 30	Mean, 6 stations
Elko County, NE.	.. ..	.. ..	1881	17 53	17 37	Mean, 8 stations
Elko County, NW.	.. ..	.. ..	1883	17 44	17 30	Mean, 3 stations
Humboldt County, NE.	.. ..	.. ..	1878	17 45	17 45	Mean, 60 stations
Humboldt County, NW.	.. ..	.. ..	1874	17 40	17 44	Mean, 22 stations
West'n Bndry; mean, 15 sta.	41 30	120 00	1872.8	18 19	18 29	A. W. Von Schmidt
Do.	41 43	120 00	1872.8	18 46	18 56	Do.
Eastern Boundary	41 48	114 03	1870.8	17 28	17 08	J. E. James
West'n Bndry; mean, 15 sta.	41 55	120 00	1872.8	18 44	18 54	A. W. Von Schmidt

NEW HAMPSHIRE

Group I	° ′	° ′		° ′ *West*	° ′ *West*	
Troy	42 50	72 11	1861.61	9 03.3	11 19	Dean & Halter
Chesterfield	42 54	72 26	1890.71	11 12.7	11 39	J. B. Baylor
Unkonoonuc	42 59	71 35	1848.77	9 04.1	12 18	J. S. Ruth
Patuccawa	43 07	71 12	1849.63	10 42.8	13 52	C. O. Boutelle
Gunstock	43 31	71 22	1860.54	10 54.1	13 15	G. W. Dean
Hanover	43 42	72 17	1898.83	12 24.4	12 31	E. Smith
Littleton	44 19	71 48	1873.74	12 35.1	14 00	T. C. Hilgard
Gorham	44 22	71 15	1873.73	13 47.0	15 12	Do.
Group II						
Hinsdale	42 46	72 29	1772.5	6 00	11 43	—— Wright
Chesterfield	42 53	72 29	1891	11 30	11 54	Sam'l Wadsworth
Keene	42 56	72 17	1900	12 02	12 05	Do.
Concord	43 12	71 29	1879.5	11 27	12 29	J. N. McClintock
Farmington	43 23	71 04	1889.5	13 12	13 42	G. W. Fernald
Claremont	43 23	72 22	1896	12 29	12 41	County surveyor
Lebanon	43 40	72 12	1874?	11 30	12 52	C. A. Downs
Plymouth	43 45	71 42	1830.7	8 32	13 03	J. D. Graham
West Rumney	43 49	71 53	1830.7	9 38	14 09	Do.
Warren	43 56	71 55	1830.7	9 08	13 39	Do.
Haverhill	44 02	72 05	1830.7	7 32	12 03	Do.
Lyman	44 13	71 54	1879.5	11 33	12 35	J. N. McClintock
Fabyan Hotel	44 16	71 25	1845.5	11 32	15 00	J. Locke
Lancaster	44 30	71 34	1900	13 24	13 27	J. I. Williams

NEW JERSEY

Group I	° ′	° ′		° ′ *West*	° ′ *West*	
Cape May	38 56	74 56	1891.41	5 40.7	6 15	G. R. Putnam
Townbank	38 59	74 58	1846.50	2 59.0	6 38	J. Locke
Sea Isle City	39 09	74 42	1884.45	5 53.8	6 53	J. B. Baylor
Egg Island Light-House	39 10	75 08	1846.48	3 03.0	6 42	J. Locke
Port Norris	39 15	75 01	1846.48	3 04.4	6 43	Do.
Atlantic City	39 22	74 25	1860.64	4 54.0	7 34	C. A. Schott

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

NEW JERSEY—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group I—Continued	° ′	° ′		*West* ° ′	*West* ° ′	
Pine Mount	39 25	75 20	1846.46	3 14.2	6 53	J. Locke
Hawkins	39 26	75 17	1846.47	2 58.8	6 38	Do.
Old Inlet, Tuckers Island	39 31	74 17	1846.86	4 27.8	8 05	T. J. Lee
Long Beach	39 32	74 16	1860.65	5 18.5	7 59	C. A. Schott
Church Landing	39 41	75 31	1846.43	5 49.1	9 28	J. Locke
Barnegat Light-House	39 46	74 06	1860.65	5 24.0	8 04	C. A. Schott
Chew	39 48	75 10	1846.53	3 45.2	7 24	J. Locke
White Hill	40 08	74 44	1846.38	4 25.9	8 05	Do.
Mount Rose	40 22	74 43	1852.62	5 31.8	8 46	J. E. Hilgard
Mount Mitchell	40 24	74 00	1844.04	5 39.4	9 27	Bache & Hall
Sandy Hook	40 28	74 00	1895.47	8 24.8	8 45	J. B. Baylor
New Brunswick	40 30	74 27	1895.67	7 47.0	8 06	Do.
Newark	40 45	74 10	1846.37	5 35.1	9 14	J. Locke
Bergen Neck	40 46	74 03	1840.66	5 53	9 54	S. C. Rowan
Group II						
Ocean View	39 11	74 44	1887.8	5 40	6 26	N. J. Geol. Survey
Maurice River Light-House	39 12	75 02	1883.5	5 05	6 08	Do.
Port Norris	39 15	75 02	1887.8	5 24	6 10	Do.
Atlantic City	39 22	74 25	1887.8	6 22	7 08	Do.
Bridgeton	39 26	75 14	1887.8	5 19	6 05	Do.
Mays Landing	39 27	74 44	1892.6	6 29	6 58	Mean, 6 compasses
Newfield	39 32	75 01	1887.8	5 45	6 31	N. J. Geol. Survey
Bass River	39 35	74 27	1885.6	6 30	7 25	Do.
Salem	39 35	75 28	1894.6	6 19	6 42	Mean, 4 compasses
Tuckerton	39 36	74 20	1887.9	6 52	7 38	N. J. Geol. Survey
West Creek	39 38	74 19	1887.5	7 10	7 58	H. S. Haines
Hammonton	39 39	74 49	1885.9	5 53	6 47	N. J. Geol. Survey
Clayton	39 39	75 06	1885.9	5 46	6 40	Do.
Winslow	39 40	74 51	1887.8	5 57	6 43	Do.
Manahawkin	39 42	74 15	1886.7	7 00	7 50	G. H. Blakeley
Waterford	39 43	74 51	1885.9	5 49	6 43	N. J. Geol. Survey
Barnegat Village	39 45	74 14	1887.9	6 52	7 38	Do.
Barnegat Light-House	39 46	74 06	1880.5	6 57	8 11	A. P. Irons
Clarksboro	39 48	75 14	1870.1	5 48	7 46	W. Haines
Shamong Station	39 49	74 32	1887.9	6 36	7 22	N. J. Geol. Survey
Berlin	39 49	74 55	1885.9	5 35	6 29	Do.
Forked River	39 50	74 18	1876.5	6 03.2	7 34	C. J. Moore
Woodbury	39 51	75 10	1896.1	6 28	6 46	Mean, 5 compasses
Haddonfield	39 53	75 02	1887.8	6 10	6 56	N. J. Geol. Survey
Seaside Park	39 55	74 05	1887.9	6 56	7 42	Do.
Camden	39 56	75 06	1887.8	6 10	6 56	Do.
Whiting	39 57	74 23	1887.9	7 09	7 55	Do.
Brown Mills	39 58	74 35	1885.8	6 53	7 47	Do.
Smithville	39 59	74 45	1885.8	6 32	7 26	Do.
Mount Holly	40 00	74 47	1897.6	7 35	7 48	H. S. Haines
New Egypt	40 04	74 32	1887.9	6 56	7 42	N. J. Geol. Survey
Columbus	40 04	74 42	1885.8	7 15	8 09	Do.
Ellisdale	40 07	74 35	1885.8	6 45	7 39	Do.
Sea Girt	40 08	74 03	1887.9	7 09	7 55	Do.
Bordentown	40 09	74 43	1885.8	7 03	7 57	Do.
Imlaystown	40 10	74 31	1765.8	4 45	9 08	J. Lawrence
Trenton	40 13	74 44	1893.6	8 04	8 30	H. S. Haines
Hamilton	40 14	74 40	1885.8	6 58	7 52	N. J. Geol. Survey

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

NEW JERSEY—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*West* ° ′	*West* ° ′	
Freehold	40 16	74 16	1887.9	7 15	8 01	N. J. Geol. Survey
Hightstown	40 16	74 32	1887.8	7 18	8 04	Do.
Redbank	40 20	74 04	1887.9	7 23	8 09	Do.
Lambertville, SE. of town	40 21	74 56	1887.9	[a]7 11	7 57	Do.
Jamesburg	40 21	74 27	1887.5	7 25	8 12	H. M. Thomas
Goat Hill	40 21	74 56	1883?	7	8 03	Phila. Water Dept.
Princeton	40 21	74 40	1887.9	7 09	7 55	N. J. Geol. Survey
Princeton, NNW. of town	40 22	74 40	1887.9	[a]7 21	8 07	Do.
Seabright	40 22	73 59	1884.7	7 12	8 10	G. H. Blakeley
Lambertville	40 23	74 57	1887.9	6 55	7 41	N. J. Geol. Survey
Morganville	40 23	74 14	1887.9	7 35	8 21	Do.
Blawenburg	40 25	74 43	1887.9	7 36	8 22	Do.
Perth Amboy	40 30	74 16	1885.5	7 43	8 38	G. H. Blakeley
Middlebush	40 30	74 32	1884.9	7 13	8 10	Do.
Flemington	40 31	74 51	1887.9	7 14	8 00	N. J. Geol. Survey
Frenchtown	40 32	75 04	1887.9	7 10	7 56	Do.
Plainfield	40 36	74 26	1887.9	7 40	8 26	Do.
Cushetunk	40 36	74 49	1883.8	7 29	8 31	Do.
Somerville, N. of town	40 36	74 37	1887.8	7 19	8 05	Do.
Somerville, foot of 1st mt.	40 36	74 37	1887.9	7 15	8 01	Do.
Somerville, crest of 1st mt.	40 36	74 36	1887.9	[a]6 42	7 28	Do.
Martinsville, 1 m. W.	40 36	74 35	1887.9	[a]8 32	9 18	Do.
Second Mt., crest	40 37	74 34	1887.9	[a]7 05	7 51	Do.
North of Mt. Horeb Church	40 37	74 34	1887.9	[a]7 35	8 21	Do.
Plainfield, crest of 1st mt.	40 37	74 27	1887.9	[a]8 18	9 04	Do.
Pattenburg	40 38	75 01	1887.8	6 53	7 39	Do.
Plainfield, crest of 2d mt.	40 39	74 27	1887.9	7 42	8 28	Do.
Lebanon	40 39	74 49	1887.8	7 48.5	8 35	Do.
Musconetcong Mt., foot	40 40	75 02	1887.8	[a]6 28	7 14	Do.
Musconetcong Mt., crest	40 40	75 01	1887.8	[a]6 42	7 28	Do.
Valley Station	40 41	75 02	1887.8	7 04	7 50	Do.
Gillette	40 41	74 28	1887.9	7 53.5	8 39	Do.
Highbridge	40 41	74 55	1887.8	8 18	9 04	Do.
Glen Gardner	40 42	74 56	1887.8	[a]6 59	7 45	Do.
Phillipsburg	40 42	75 10	1887.8	6 10	6 56	Do.
Jersey City	40 43	74 04	1871.4	7 55	9 47	D. E. Culver
Morris and Somerset counties, boundary line	40 43	74 44	1894.0	8 00	8 25	E. A. Bowser
Newark	40 45	74 10	1878	7 40	9 02	P. Witzel
Harrison	40 45	74 09	1887.8	7 42	8 28	N. J. Geol. Survey
Orange	40 46	74 15	1887.9	8 03.3	8 49	Do.
W. Hoboken, top of ridge	40 46	74 02	1887.8	[a]9 22	10 08	Do.
W. Hoboken, base of Palisades	40 47	74 01	1887.8	[a]8 55	9 41	Do.
Secaucus	40 47	74 03	1887.8	8 45	9 31	Do.
Chester	40 47	74 42	1887.8	7 56	8 42	Do.
Morristown, on mt., west	40 47	74 30	1887.9	8 12	8 58	Do.
Morristown, S. of Horse hill	40 47	74 29	1887.9	8 33	9 19	Do.
Morristown, on drift, east	40 48	74 28	1887.9	9 00	9 46	Do.
Cooks Bridge and Hanover	40 48	74 22	1887.9	8 02	8 48	Do.
Livingston	40 48	74 19	1887.9	8 10	8 56	Do.
Bartley, Schooley Mt. slope	40 49	74 44	1887.8	[a]4 08	4 54	Do.
Bartley, west side of valley	40 49	74 43	1887.8	9 48	10 34	Do.
Bartley, east side of valley	40 49	74 42	1887.8	9 03	9 49	Do.
Bartley, top of ridge	40 49	74 41	1887.8	8 29	9 15	Do.

[a] Locally disturbed area.

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

NEW JERSEY—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*West* ° ′	*West* ° ′	
Schooley Mountain	40 50	74 48	1887.8	[a]6 25	7 11	N. J. Geol. Survey
Belvidere	40 50	75 05	1887.8	[a]5 32	6 18	Do.
Hackettstown, south	40 51	74 50	1887.8	[a]6 50	7 36	Do.
Hackettstown, west	40 51	74 52	1887.8	7 02	7 48	Do.
Budd Lake	40 52	74 43	1880.0	6 42	7 58	Do.
Hackensack	40 53	74 02	1887.8	7 49	8 35	Do.
Teaneck	40 53	74 01	1887.8	8 09	8 55	Do.
Linwood, top of Palisades	40 53	73 58	1887.8	9 03	9 49	Do.
Linwood, base of Palisades	40 53	73 57	1887.8	7 57	8 43	Do.
Paterson	40 53	74 10	1868.9	6 37	8 40	Fonda, Ryerson
Dover	40 53	74 34	1887.8	8 58	9 44	N. J. Geol. Survey
Dover, 1 mile east	40 53	74 33	1887.8	8 20	9 06	Do.
Nordhoff	40 54	73 58	1887.8	8 29	9 15	Do.
Boonton	40 54	74 24	1887.9	8 16	9 02	Do.
Warrenville	40 54	74 50	1881.7	6 00	7 10	Do.
Lake Hopatcong	40 55	74 40	1884.8	8 20.5	9 18	G. H. Blakeley
Allamuchy, slope of mt.	40 55	74 48	1887.8	9 00	9 46	N. J. Geol. Survey
Allamuchy	40 55	74 49	1887.8	8 18	9 04	Do.
Allamuchy, 2 miles NW.	40 56	74 50	1887.8	7 45	8 31	Do.
Fairlawn	40 57	74 07	1887.8	8 06	8 52	Do.
Hawthorne	40 57	74 09	1887.8	7 51	8 37	Do.
High Mountain	40 58	74 12	1883.6	[a]9 03	10 05	A. A. Tittsworth
Lake Hopatcong	40 58	74 37	1887.8	7 49	8 35	N. J. Geol. Survey
Do.	40 58	74 38	1887.8	8 34	9 20	Do.
Pompton	40 59	74 19	1887.8	9 16	10 02	Do.
Andover	40 59	74 44	1881.7	6 25	7 35	Do.
Blairstown	40 59	74 58	1887.8	7 25	8 11	Do.
New York Boundary	41 00	73 54	1882.5	9 02	10 08	G. H. Blakeley
Do.	41 00	73 55	1882.5	9 32	10 38	Do.
Do.	41 01	73 56	1882.5	8 22	9 28	Do.
Bearfort Mountain	41 01	74 24	1882.6	8 00	9 06	Topog. Survey
Hardwick Township	41 01	74 56	1886.3	7 11	8 03	A. H. Konkle
New York Boundary	41 02	73 58	1882.5	8 05	9 11	G. H. Blakeley
Do.	41 02	73 59	1882.5	8 32	9 38	Do.
Do.	41 02	74 00	1882.5	8 42	9 48	Do.
Green Pond Mt., crest	41 02	74 28	1887.8	7 57	8 43	N. J. Geol. Survey
Green Pond Mt., W. base	41 03	74 28	1887.8	7 31	8 17	Do.
Oak Ridge	41 03	74 29	1887.8	7 58	8 44	Do.
Newton	41 03	74 45	1887.9	7 17	8 03	A. H. Konkle
Darlington	41 05	74 13	1879.6	9 40	10 58	N. J. Geol. Survey
Little Swartswood Lake	41 05	74 49	1886.1	8 16	9 09	G. H. Blakeley
Franklin Furnace	41 06	74 33	1887.8	[a]7 38	8 24	N. J. Geol. Survey
Mahwah	41 07	74 09	1887.8	8 23	9 09	Do.
West of Ramapo River	41 07	74 10	1887.8	8 40	9 26	Do.
Monroe	41 07	74 38	1887.8	7 03	7 49	Do.
Hamburg	41 08	74 35	1882.8	7 04	8 09	Topog. Survey
Greenwood Lake	41 09	74 22	1887.8	[a]8 06	8 52	N. J. Geol. Survey
Culvers Gap	41 11	74 47	1887.8	7 25	8 11	Do.
State Line, Bearfort Mt.	41 11	74 21	1874.6	6 02	7 41	E. A. Bowser
State Line, Longhouse Creek	41 12	74 21	1874.6	7 14	8 53	Do.
Vernon	41 12	74 30	1887.8	[a]6 41	7 27	N. J. Geol. Survey
Wawayanda Mines	41 13	74 24	1874.6	5 09	6 48	E. A. Bowser
Deckertown	41 13	74 36	1887.8	7 29	8 15	N. J. Geol. Survey

[a] Locally disturbed area.

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

NEW JERSEY—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*West* ° ′	*West* ° ′	
Layton	41 13	74 50	1887.8	7 18	8 04	Do.
Mount Salem	41 19	74 37	1887.8	7 39	8 25	Do.
High Point	41 19	74 40	1887.8	7 50	8 36	Do.
Montague	41 19	74 48	1887.8	7 13.5	8 00	Do.
New York Boundary	41 20	74 38	1882.5	8 52	9 58	G.H. Blakeley
Tri-State Rock	41 21	74 42	1887.8	7 50	8 36	N.J. Geol. Survey

NEW MEXICO

Group I	° ′	° ′		*East* ° ′	*East* ° ′	
Deming	32 17	107 50	1888.90	12 46.3	12 20	J. B. Baylor
Carlsbad	32 26	104 15	1902.09	11 38.9	11 39	E. D. Preston
McMillan	32 40	104 22	1902.10	11 18.0	11 18	Do.
Hope	32 48	104 45	1902.26	11 39.2	11 40	Do.
Stegman	32 51	104 25	1902.27	11 35.9	11 37	Do.
Alamogordo	32 54	105 59	1902.21	11 59.3	12 00	Do.
Upper Penasco	32 55	105 29	1902.24	11 23.6	11 24	Do.
Lower Penasco	32 55	105 15	1902.25	11 35.1	11 36	Do.
Tularosa	33 05	106 02	1902.23	12 15.8	12 16	Do.
Hagerman	33 08	104 18	1902.29	11 19.6	11 20	Do.
Mescalero	33 11	105 48	1902.22	12 23.4	12 24	Do.
Picacho	33 21	105 09	1902.15	11 46.8	11 47	Do.
Roswell	33 24	104 32	1902.12	12 06.5	12 07	Do.
Lincoln	33 31	105 24	1902.16	12 09.4	12 10	Do.
Capitan	33 35	105 35	1902.18	12 22.7	12 23	Do.
Campbell	33 37	104 15	1902.14	11 41.0	11 41	Do.
Fort Craig	33 38	107 00	1899.96	12 28.0	12 24	J. A. Fleming
Carrizozo Ranch	33 42	105 53	1902.20	12 31.4	12 32	E. D. Preston
White Oaks	33 46	105 44	1902.19	12 40.0	12 40	Do.
Kenna	33 53	103 47	1902.13	11 48.4	11 49	Do.
Socorro	34 05	106 53	1899.95	12 46.0	12 42	J. A. Fleming
Portales	34 12	103 20	1901.93	11 25.8	11 26	E. D. Preston
Albuquerque	35 06	106 39	1899.93	12 58.5	12 54	J. A. Fleming
Grant	35 10	107 51	1899.94	14 17.5	14 13	Do.
Fort Wingate	35 29	108 32	1899.94	13 19.5	13 15	Do.
East Las Vegas	35 35	105 14	1899.97	12 47.4	12 43	Do.
Santa Fe	35 41	105 57	1899.92	12 33.3	12 29	Do.
Fort Union	35 54	105 01	1888.87	13 25.0	12 54	J. B. Baylor
Springer	36 22	104 36	1899.98	14 03.3	13 58	J. A. Fleming
Clayton	36 27	103 10	1899.99	10 24.1	10 19	Do.
Tres Piedras	36 42	105 57	1899.92	13 18.5	13 14	Do.
Lumberton	36 57	106 55	1899.91	13 41.2	13 37	Do.
Group II						
San Luis Springs	31 20	108 48	1855.3	11 45	11 02	W. H. Emory
Mexican Boundary	31 20	108 12	1892.5	12 03.0	11 43	J. F. Hayford
Do.	31 20	108 38	1892.5	11 53.6	11 34	Do.
Do.	31 20	108 52	1892.6	12 14.0	11 54	Do.
Agua del Perro	31 21	108 20	1855.3	11 58	11 15	W. H. Emory
Intersection Point	31 46	106 50	1855.7	11 40	10 57	Do.

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

NEW MEXICO—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		° ′ *East*	° ′ *East*	
Initial Point	31 47	106 28	1855.1	11 55	11 12	W. H. Emory
Mexican Boundary	31 47	107 22	1892.3	10 16.7	9 57	J. F. Hayford
Do.	31 47	107 44	1892.3	11 56.3	11 36	Do.
Do.	31 47	108 12	1892.4	12 00.7	11 41	Do.
Grant County, southwest	.. ..	.... ..	1883	12 21	11 47	Mean, 34 stations
Carrizalillo	31 51	107 56	1855.2	12 02	11 20	W. H. Emory
Grant County, southeast	.. ..	.... ..	1886	12 21	11 51	Mean, 22 stations
Eddy County	32 05	104 30	1901.0	11 33	11 31	B. A. Nymeyer
Do.	32 10	103 20	1899.6	10 45	10 39	Do.
Eddy County, southeast	.. ..	.... ..	1884	11 32	10 53	Mean, 10 stations
Eddy County, southwest	.. ..	.... ..	1883	12 00	11 19	Mean, 36 stations
Donna Ana County, SE.	.. ..	.... ..	1880	12 27	11 49	Mean, 40 stations
Donna Ana County, W.	.. ..	.... ..	1883	12 25	11 51	Mean, 57 stations
Donna Ana	32 22	106 45	1851.5	12 07	11 27	W. H. Emory
Fort Cummings	32 27	107 40	1873.5	12 29.8	11 46	S. E. Tillman
Fort Selden	32 29	106 55	1870.4	12 39	11 52	Map of reservation
Hudson Hot Springs	32 33	108 00	1878.5	12 30	11 50	Engineer officer
Lincoln County, southeast	.. ..	.... ..	1884	12 43	12 04	Mean, 5 stations
Lincoln County, southwest	.. ..	.... ..	1884	12 06	11 27	Mean, 11 stations
Apache Tejo	32 38	108 08	1878.5	12 42	12 02	Engineer officer
Eddy County	32 40	103 30	1895.6	11 08	10 52	B. A. Nymeyer
Do.	32 41	104 44	1895.4	11 35	11 19	Do.
Eddy County, northwest	.. ..	.... ..	1882	11 54	11 21	Mean, 32 stations
Grant County, northwest	.. ..	.... ..	1883	12 33	11 59	Mean, 43 stations
Grant County, northeast	.. ..	.... ..	1883	12 37	12 03	Mean, 16 stations
Copper Mines	32 48	108 04	1851.5	11 22	10 42	W. H. Emory
Fort Bayard	32 48	108 09	1878.5	12 56	12 16	Engineer officer
Sierra County, south	.. ..	.... ..	1885	12 48	12 16	Mean, 15 stations
Donna Ana County, NE.	.. ..	.... ..	1882	12 28	11 52	Mean, 36 stations
Sierra County, north	.. ..	.... ..	1882	12 50	12 14	Mean, 49 stations
San Francisco River	33 12	108 52	1873.5	13 31.4	12 47	R. L. Hoxie
Water Hole	33 13	108 46	1873.5	13 30	12 46	Do.
San Francisco River	33 15	108 52	1873.5	12 51.7	12 08	Do.
Chaves County, southeast	.. ..	.... ..	1882	11 28	10 45	Mean, 24 stations
Chaves County, southwest	.. ..	.... ..	1880	12 16	11 30	Mean, 42 stations
Lincoln County, mid. east	.. ..	.... ..	1880	12 22	11 36	Mean, 30 stations
Lincoln County, mid. west	.. ..	.... ..	1873	12 40	11 50	Mean, 7 stations
Socorro County, southeast	.. ..	.... ..	1881	12 18	11 41	Mean, 50 stations
San Francisco River	33 26	108 55	1873.5	13 49.3	13 05	R. L. Hoxie
Fort Stanton	33 30	105 32	1878.5	12 24	11 40	Engineer officer
Socorro County, southwest	.. ..	.... ..	1884	12 58	12 25	Mean, 56 stations
Socorro County, mid. south	.. ..	.... ..	1882	12 43	12 07	Mean, 48 stations
Fort Tulerosa	33 53	108 30	1873.5	13 17.7	12 34	R. L. Hoxie
Chaves County, northeast	.. ..	.... ..	1882	12 13	11 30	Mean, 65 stations
Chaves County, northwest	.. ..	.... ..	1881	12 30	11 46	Mean, 49 stations
Lincoln County, northeast	.. ..	.... ..	1882	12 34	11 51	Mean, 40 stations
Lincoln County, northwest	.. ..	.... ..	1881	12 42	12 00	Mean, 21 stations
Oak Spring	34 03	108 55	1873.5	12 34.7	11 51	R. L. Hoxie
Socorro	34 05	106 53	1901.2	12 28	12 26	F. A. Jones
Socorro County, northeast	.. ..	.... ..	1869	12 53	12 06	Mean, 21 stations
Socorro County, northwest	.. ..	.... ..	1882	13 18	12 42	Mean, 71 stations
Socorro County, mid. north	.. ..	.... ..	1881	13 13	12 36	Mean, 85 stations
Initial Point, N. Mex. mer.	34 17	106 50	1855.3	12 45	12 02	
Fort Sumner	34 25	104 08	1876.1	13 45	12 45	—— Shinn
Guadaloupe County, SE.	.. ..	.... ..	1882	12 18	11 35	Mean, 45 stations

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

NEW MEXICO—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Guadaloupe County, SW.	.. ..	... ..	1880	12 36	11 50	Mean, 21 stations
Valencia County	.. ..	105 06	1881	12 35	11 55	Mean, 44 stations
Do.	.. ..	106 07	1879	12 33	11 54	Mean, 22 stations
Estancia Ranch and Spring	34 45	106 04	1876.5	12 43	11 57	Engineer officer
Antelope Spring	34 50	106 04	1875.5	13 26	11 40	Do.
Isleta	34 54	106 40	1853.8	13 13	12 23	J. C. Ives
Valencia County	.. ..	107 08	1881	13 20	12 43	Mean, 48 stations
Do.	.. ..	108 09	1882	13 28	12 52	Mean, 62 stations
Near Ojo Caliente	34 57	109 00	1873.5	13 58.2	13 14	R. L. Hoxie
Guadaloupe County, NE.	.. ..	... ..	1879	12 24	11 36	Mean, 31 stations
Guadaloupe County, NW.	.. ..	... ..	1871	12 52	11 55	Mean, 35 stations
Rio San Jose	35 01	107 14	1853.9	13 46	13 04	J. C. Ives
Cedar Forest	35 01	108 55	1853.9	13 01	12 19	Do.
Agua Fria	35 02	107 58	1853.9	13 25	12 43	Do.
Inscription Rock	35 03	108 14	1853.9	12 57	12 15	Do.
Covero	35 05	107 26	1853.9	13 49	13 07	Do.
Hay Camp	35 05	107 39	1853.9	13 56?	13 14	Do.
Zuni River	35 06	108 39	1853.9	13 24	12 42	Do.
Santa Fe County, south	.. ..	... ..	1876	13 18	12 32	Mean, 13 stations
Nutria Springs	35 18	108 33	1873.5	14 16.2	13 32	R. L. Hoxie
Fort Bascom	35 24	103 50	1856.5	12 50	11 49	
Bernalillo County, east	.. ..	... ..	1881	13 06	12 26	Mean, 45 stations
San Miguel County, west	.. ..	... ..	1875	13 15	12 23	Mean, 38 stations
San Miguel County, middle	.. ..	... ..	1878	13 02	12 13	Mean, 24 stations
San Miguel County, east	.. ..	... ..	1877	12 52	12 02	Mean, 5 stations
Bernalillo County, middle	.. ..	... ..	1882	13 30	12 54	Mean, 37 stations
Bernalillo County, west	.. ..	... ..	1881	13 42	13 05	Mean, 23 stations
Magnetic Station	35 40	106 50	1855.5	13 40	12 52	
Santa Fe County, north	.. ..	... ..	1883	13 30	12 51	Mean, 8 stations
Union County, south	.. ..	... ..	1880	12 30	11 44	Mean, 57 stations
Mora River	35 59	105 19	1874.5	14 40	13 47	C. E. Blunt
Mora County, east	.. ..	... ..	1881	13 23	12 39	Mean, 28 stations
Mora County, west	.. ..	... ..	1882	13 42	12 59	Mean, 5 stations
Coyote Creek	36 08	105 14	1874.5	14 15	13 22	C. E. Blunt
Ocate River	36 10	105 00	1874.5	14 15.1	13 22	Do.
Embuda	36 11	105 58	1874.5	13 15.1	12 27	R. Birnie
Rio Arriba County, SE.	.. ..	... ..	1882	13 34	12 54	Mean, 26 stations
Rio Arriba County, SW.	.. ..	... ..	1882	13 00	12 24	Mean, 9 stations
San Juan County, southeast	.. ..	... ..	1882	13 02	12 26	Mean, 21 stations
Abiquin	36 12	106 19	1874.5	13 54.0	13 06	R. Birnie
Ojo Caliente Creek	36 17	106 02	1874.5	13 15	12 27	Do.
Taos County	.. ..	... ..	1881	13 27	12 47	Mean, 20 stations
Colfax County, east	.. ..	... ..	1882	13 33	12 50	Mean, 16 stations
Colfax County, west	.. ..	... ..	1881	13 27	12 43	Mean, 3 stations
Union County, north	.. ..	... ..	1880	12 34	11 48	Mean, 21 stations
Vermejo Creek	36 42	104 47	1874.5	14 30	13 37	C. E. Blunt
Tierra Amarilla	36 42	106 33	1873.5	13 42.4	12 53	W. L. Marshall
Rio Arriba County, NW.	.. ..	... ..	1882	13 13	12 37	Mean, 21 stations
Rio Arriba County, NE.	.. ..	... ..	1882	13 47	13 07	Mean, 18 stations
San Juan County, NW.	.. ..	... ..	1881	13 36	12 59	1 station
San Juan County, NE.	.. ..	... ..	1881	13 12	12 35	Mean, 32 stations
Colorado Boundary	37 00	103 13	1868.6	12 55	11 51	E. N. Darling
Do.	37 00	103 42	1868.6	13 20	12 18	Do.
Do.	37 00	104 08	1868.6	13 27	12 27	Do.
Do.	37 00	104 38	1868.7	13 46	12 48	Do.

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

NEW MEXICO—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Colorado Boundary	37 00	105 03	1868.7	13 52	12 56	F. N. Darling
Do.	37 00	105 07	1873.5	14 01.3	13 07	W. L. Marshall
Do.	37 00	105 30	1868.7	13 47	12 53	E. N. Darling
Do.	37 00	105 58	1868.7	13 29	12 37	Do.
Do.	37 00	106 23	1868.8	13 49	12 59	Do.
Do.	37 00	106 47	1868.8	14 00	13 12	Do.
Do.	37 00	107 35	1868.8	14 03	13 17	Do.
Do.	37 00	108 03	1868.9	14 04	13 20	Do.
Do.	37 00	108 52	1868.9	14 06	13 25	Do.

NEW YORK

Group I	° ′	° ′		*E or W* ° ′	*West.* ° ′	
Cole	40 32	74 14	1846.35	5 37.4 W	9 04	J. Locke
Far Rockaway	40 36	73 46	1875.59	7 12 W	8 37	J. M. Poole
Fire Island, West Base	40 38	73 13	1860.66	7 45.7 W	10 00	C. A. Schott
Howard	40 38	74 05	1840.49	5 01 W	8 51	S. C. Rowan
Mount Prospect	40 40	73 58	1860.73	6 44.0 W	9 11	C. A. Schott
Babylon	40 42	73 20	1875.62	7 35 W	8 50	J. M. Poole
Patchogue	40 45	73 02	1875.58	8 00.5 W	9 16	Do.
West Hills	40 49	73 26	1865.62	7 01.5 W	9 00	E. Goodfellow
Legget	40 49	73 54	1847.80	5 41.0 W	9 02	R. H. Fauntleroy
Riverside Park	40 49	73 58	1885.79	8 59.7 W	9 48	J. B. Baylor
Manhattanville, B. Asylum	40 50	73 56	1846.33	5 09.7 W	8 37	J. Locke
West Hampton	40 51	72 34	1875.64	8 40 W	9 55	J. M. Poole
Ruland	40 51	73 02	1865.40	7 30.8 W	9 27	E. Goodfellow
Oyster Bay	40 52	73 32	1844.71	6 50.5 W	10 17	J. Renwick
Sands Point	40 52	73 44	1847.77	6 09.9 W	9 31	R. H. Fauntleroy
New Rochelle	40 52	73 47	1844.69	5 29.5 W	9 02	J. Renwick
Drowned Meadow	40 56	73 04	1845.70	6 03.6 W	9 21	Do.
Lloyd Harbor	40 56	73 25	1844.71	6 11.6 W	9 38	Do.
East Hampton	40 58	72 12	1875.64	9 05.6 W	10 21	J. M. Poole
Sag Harbor	41 00	72 17	1860.68	8 27.7 W	10 42	C. A. Schott
Port Chester	41 00	73 40	1844.70	5 58.0 W	9 31	J. Renwick
Duer	41 00	73 54	1873.62	7 37 W	9 10	J. H. Cook
Montauk Point	41 04	71 51	1875.66	9 45 W	11 00	J. M. Poole
Greenport	41 06	72 21	1845.63	7 14.4 W	10 31	J. Renwick
Buttermilk	41 07	73 49	1833.47	3 56 W	8 11	F. R. Hassler
Bald Hill	41 13	73 29	1833.56	5 34 W	9 49	Do.
Carpenters Pt., Port Jervis	41 21	74 42	1873.47	7 04.8 W	8 56	E. Smith
Cold Spring	41 25	73 58	1855.66	5 34.0 W	8 19	C. A. Schott
Binghamton	42 05	75 56	1888.50	7 49.2 W	8 35	J. B. Baylor
Bath	42 21	77 21	1862.61	4 47.9 W	7 37	C. A. Schott
Oxford	42 26	75 40	1885.73	7 43.3 W	8 41	J. B. Baylor
Ithaca	42 27	76 29	1890.82	6 31.5 W	7 10	Do.
Albany	42 40	73 45	1896.69	10 40.8 W	10 58	R. L. Faris
Sherburne	42 41	75 33	1875.67	7 49.5 W	9 30	J. M. Poole
Otsego	42 47	74 42	1882.63	8 46.2 W	9 56	
Buffalo	42 55	78 54	1885.71	5 04.3 W	6 07	J. B. Baylor
Fenner	42 57	75 45	1882.76	7 15.4 W	8 28	Do.
Howlett	43 00	76 17	1883.66	7 47.1 W	8 56	Do.

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

NEW YORK—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group I—Continued	° ′	° ′		*E or W* ° ′	*West* ° ′	
Clinton	43 03	75 24	1874.82	8 05.5 W	9 50	T. C. Hilgard
Clyde	43 03	76 52	1883.72	7 04.4 W	8 13	J. B. Baylor
Loomis	43 21	76 17	1882.86	8 10.0 W	9 23	Do.
Pen Mount	43 23	75 16	1882.64	8 32.2 W	9 42	Do.
Prospect	43 26	73 45	1882.60	10 50.8 W	12 01	Do.
Mannsville	43 43	76 03	1884.44	6 50.9 W	7 57	J. B. Boutelle
Pierrepont Manor	43 44	76 03	1874.80	6 11.9 W	8 00	T. C. Hilgard
Potsdam	44 37	75 00	1874.79	9 25.1 W	11 10	Do.
Rouse Point.	45 00	73 21	1879.75	13 39.1 W	15 01	J. B. Baylor
Group II						
Jamaica	40 41	73 48	1835.5	4 00 W	8 08	Regents' Report
Cold Spring, L. I.	40 52	73 28	1897.2	9 26.4 W	9 38	E. Jones
East Hampton	41 00	72 12	1834.8	6 08 W	10 08	Regents' Report
Palisades, top of ridge	41 01	73 55	1887.8	9 02 W	9 50	N. J. Geol. Survey
Tappan	41 02	73 57	1887.8	7 57 W	8 45	Do.
Ramapo, top of High Torn	41 08	74 09	1883.6	9 20 W	10 22	A. A. Titsworth
Sloatsburg	41 09	74 11	1874.6	7 42 W	9 24	E. A. Bowser
Liberty Corner	41 17	74 31	1874.6	6 45 W	8 27	Do.
Unionville	41 18	74 34	1874.6	6 03 W	7 45	Do.
North Salem	41 20	73 34	1843.5	6 00 W	9 46	
Monroe	41 21	74 11	1859.5	6 38 W	9 33	T. B. Brooks
Goshen	41 23	74 19	1900.4	8 20 W	8 25	V. K. Mills
West Point	41 25	73 56	1835.7	6 32 W	11 00	C. Davis
Kingston	41 54	74 00	1893	9 40 W	10 05	E. B. Codwise
Travis, near Initial Point	42 00	75 21	1882.6	7 30 W	8 40	H. W. Clarke
Finn, near milestone 20	42 00	75 46	1877.8	7 22 W	8 53	Do.
Waverly, near milestone 60	42 00	76 32	1877.6	5 31 W	7 06	Do.
New Pr. Line, milestone 82	42 00	76 58	1795.5	2 07 W	7 30	B. Ellicott
Pa. Line. 109½ m. w. of Del.	42 00	77 28	1787.5	1 52 W	7 04	De Witt & others
Pa. Line, 136⅝ m.W. of Del.	42 00	78 05	1787.5	0 45 W	5 56	Do.
Pa. Line, 195⅛ m.W. of Del.	42 00	79 09	1787.5	0 55 W	6 06	Do.
Madalin	42 03	73 54	1878.0	8 46 W	10 10	G. Cooke
Downsville	42 03	74 59	1890.5	7 42 W	8 20	E. W. Lindsley
Binghamton	42 05	75 56	1895	7 50 W	8 12	County surveyor
New Pr. Line, 6 m.	42 05	76 58	1795.5	1 35 W	6 58	B. Ellicott
Ancram	42 06	73 37	1853.5	7 39 W	10 50	J. T. Hogeboom
Owego	42 06	76 16	1895	7 15 W	7 37	Asa Stanton
New Pr. Line, Chemung R.	42 07	76 58	1795.5	2 05 W	7 28	B. Ellicott
Elmira	42 08	76 49	1899	7 45 W	7 53	A. McConnel
Livingston	42 10	73 47	1888.5	9 31 W	10 13	R. Hood
Holland Land Co.	42 10	78 15	1798.5	1 09 W	6 35	A. Parter
Do.	42 10	78 23	1798.5	1 01 W	6 27	J. Smedley
New Pr. Line, 14 m.	42 12	76 58	1795.5	2 40 W	8 03	B. Ellicott
Holland Land Co.	42 13	78 09	1799.0	0 51.5 W	6 19	Atwater & Benton
Belmont	42 13	78 05	1900.0	6 00 W	6 06	L. Gorton
Hudson	42 15	73 48	1888.5	0 31 W	10 13	R. Hood
Holland Land Co.	42 15	78 22	1798.5	1 12 W	6 38	J. Smedley
Delhi	42 15	74 57	1884.0	7 30.5 W	8 35	E. W. Lindsley
Mayville	42 16	79 31	1874.6	2 15.0 W	4 08	F. E. Hilgard
Ellicottville	42 18	78 44	1841.6	2 35.7 W	6 53	A. D. Bache
Holland Land Co.	42 19	79 08	1798.5	0 45 E	4 41	A. Atwater
Lampman	42 20	73 48	1880.7	9 22 W	10 35	J. T. Gardner
New Pr. Line, 23¼ m.	42 20	76 58	1795.5	1 55.5 W	7 18	B. Ellicott

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

NEW YORK—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*E or W* ° ′	*West* ° ′	
Holland Land Co.	42 20	78 40	1799.5	1 27 W	6 55	A. Atwater
Westfield	42 20	79 36	1875.7	3 11 W	4 58	F. M. Towar
Bath	42 21	77 21	1879.5	5 16 W	6 46	H. F. De Puy
Guilford	42 23	75 29	1838.5	4 30 W	8 55	
Fredonia	42 26	79 22	1895	4 50 W	5 13	County surveyor
Ithaca	42 27	76 29	1895	6 58 W	7 20	City engineer
Old Kana-andoa	42 27	78 00	1798.5	1 00 W	6 26	A. Parter
New Pr. Line, 31½ m.	42 28	76 58	1795.5	2 10 W	7 33	B. Ellicott
Dunkirk	42 29	79 21	1850.6	1 20 W	5 01	R. R. engineer
Norwich	42 30	75 30	1897.0	9 05 W	9 21	E. F. Musson
Holland Land Co.	42 30	78 06	1798.5	1 08 W	6 34	A. Atwater
Do.	42 31	79 03	1798.5	0 51 E	4 35	Do.
New Pr. Line, 37 m.	42 32	76 58	1795.5	1 45 W	7 08	B. Ellicott
Cass	42 34	73 59	1877.9	8 45 W	10 15	J. T. Gardner
Clarksville	42 34	73 58	1877.9	8 45 W	10 15	Do.
Milo	42 35	77 02	1878.5	7 15 W	8 50	Do.
New Pr. Line, 41½ m.	42 36	76 58	1795.5	2 20 W	7 43	B. Ellicott
Gorham Purchase	42 36	78 03	1798.5	0 52 W	6 18	G. Burgess
Summit	42 36	74 35	1877.9	8 45 W	10 16	J. T. Gardner
Holmes	42 38	74 31	1877.9	9 00 W	10 31	Do.
Slingerlands	42 38	73 52	1877.9	8 45 W	10 16	Do.
Helderberg	42 38	74 01	1877.7	8 45 W	10 17	Do.
Homer	42 38	76 11	1840.8	5 05 W	9 23	Regents' Report
Gardeau Reservation	42 38	77 51	1798.7	1 35 W	7 02	A. Parter
Holland Land Co.	42 39	78 13	1799.5	0 27 W	5 55	J. Dewey
Do.	42 39	78 23	1798.5	1 54 W	7 20	J. Smedley
Penn Yan	42 40	77 05	1887.4	7 17.5 W	8 08	Billinger, Sterling
New Pr. Line, 47¼ m.	42 41	76 58	1795.5	2 00 W	7 23	B. Ellicott
Mann	42 41	74 19	1877.9	9 00 W	10 31	J. T. Gardner
Knowersville	42 42	74 02	1877.9	8 45 W	10 16	Do.
Holland Land C	42 43	78 13	1798.5	0 37 W	6 03	A. Atwater
Hamburg	42 43	78 49	1892.5	3 30 W	4 04	E. S. Nott
Troy	42 43	73 40	1901.1	11 02 W	11 08	E. R. Cary
Sears	42 44	74 15	1877.9	9 15 W	10 46	J. T. Gardner
Winn	42 44	74 02	1877.9	9 00 W	10 31	Do.
Warsaw	42 44	78 10	1895	5 15 W	5 38	County surveyor
Niskayuna	42 46	73 50	1877.9	9 45 W	11 15	J. T. Gardner
Freleigh	42 47	73 47	1877.9	9 30 W	11 00	Do.
Conover	42 47	74 17	1877.9	9 30 W	11 00	Do.
Chapman	42 47	74 13	1877.9	8 30 W	10 00	Do.
Oak Ridge	42 47	74 19	1880.8	9 16 W	10 34	Do.
Cherry Valley	42 48	74 47	1839.6	5 13 W	9 31	Regents' Report
Schenectady	42 49	73 55	1859.2	7 57.6 W	10 48	T. B. Brooks
Hamilton	42 49	75 34	1837.8	4 30 W	8 58	Regents' Report
Holland Land Co.	42 50	78 19	1799.5	0 20 W	5 48	J. Dewey
Do.	42 51	78 11	1799.5	1 05 W	6 33	Do.
New Pr. Line, 60 m.	42 52	76 58	1795.5	1 45 W	7 08	B. Ellicott
Geneva	42 52	76 59	1833.8	3 49 W	8 32	Regents' Report
Cooks Pt., Canandaigua L.	42 52	77 17	1888.4	6 57.7 W	7 54	Dowling, Hayford
Canajoharie	42 53	74 35	1839.8	6 05 W	10 26	Regents' Report
Vanetten	42 54	74 00	1877.9	10 15 W	10 46	J. T. Gardner
Fort Erie	42 54	78 59	1839.5	1 15 W	6 40	Chart
Reman	42 54	74 36	1880.8	9 10 W	10 28	J. T. Gardner
Cazenovia	42 55	75 51	1843.5	3 52 W	7 57	Regents' Report
Auburn	42 55	76 33	1833.8	3 43 W	8 25	Do.

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

NEW YORK—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*E or W* ° ′	*West* ° ′	
Tassel	42 56	75 19	1879.6	8 09 W	9 32	J. T. Gardner
New Pr. Line, 65 m.	42 56	76 58	1795.5	2 05 W	7 28	B. Ellicott
Hoxsie	42 56	76 23	1878.6	6 50 W	8 21	J. T. Gardner
Ostrander	42 57	74 48	1880.7	9 06 W	10 24	Do.
Strawberry Island	42 57	78 55	1875.5	3 59 W	5 48	F. Terry
Yule	42 57	74 54	1879.6	8 57 W	10 20	J. T. Gardner
Clapp	42 58	76 02	1878.6	7 12 W	8 43	Do.
Willett	42 58	74 42	1880.7	8 43 W	10 01	Do.
Nellis	42 59	74 37	1880.8	9 26 W	10 44	Do.
Seeley	42 59	76 22	1878.6	5 50 W	7 21	Do.
Green	42 59	76 02	1878.6	6 59 W	8 30	Do.
Getman	42 59	75 02	1879.6	8 25 W	9 48	Do.
Shoemaker	43 00	74 54	1879.6	8 08 W	9 31	Do.
Johnstown	43 00	74 23	1818.9	6 02 W	11 27	Regents' Report
Cossitt	43 00	76 12	1878.6	6 46 W	8 17	J. T. Gardner
Grand Island	43 00	79 01	1875.6	2 58 W	4 46	A. C. Lamson
Vedder	43 01	74 39	1880.7	9 08 W	10 26	J. T. Gardner
Eagle	43 01	75 55	1878.6	7 17 W	8 48	Do.
Tanner	43 01	76 34	1878.5	3 49 W	5 20	Do.
Cranston	43 01	75 46	1879.5	7 16 W	8 42	Do.
Herkimer	43 02	74 57	1879.6	8 28 W	9 51	Do.
Prospect	43 02	75 27	1879.5	8 35 W	10 00	Do.
Eaton	43 02	75 33	1879.5	7 56 W	9 21	Do.
Little Falls	43 03	74 52	1880.7	7 21 W	8 39	Do.
Merry	43 03	75 10	1879.6	8 38 W	10 01	Do.
Kirkville	43 04	75 56	1879.5	7 03 W	8 29	Do.
Bulger	43 04	75 40	1879.5	7 16 W	8 42	Do.
Utica	43 04	75 12	1900.6	10 07 W	10 11	E. D. Rich
Tonawanda Reservation	43 04	78 22	1799.1	1 30 W	6 57	J. Thompson
Tonawanda	43 04	78 56	1875.6	3 50 W	5 38	A. C. Lamson
Niagara Falls	43 04	79 04	1874.6	3 37.1 W	5 30	F. E. Hilgard
Conastota	43 04	75 44	1879.5	7 24 W	8 50	J. T. Gardner
Allis	43 05	75 48	1879.5	7 39 W	9 05	Do.
Jackson	43 06	75 02	1879.6	8 25 W	9 48	Do.
Collamer	43 06	76 04	1879.5	7 20 W	8 46	Do.
Davison	43 06	76 17	1878.6	6 34 W	8 05	Do.
Suspension Bridge	43 07	79 03	1875.5	2 24 W	4 13	F. M. Towar
Barto	43 08	74 53	1879.6	9 31 W	10 54	J. T. Gardner
Rochester	43 08	77 39	1893	6 42 W	7 13	J. Y. McClintock
Gorham Purchase	43 08	78 01	1798.5	1 02 W	6 28	G. Burgess
Orleans County	43 09	78 16	1888.9	6 04 W	6 53	D. D. Waldo
Schuyler	43 10	75 07	1879.6	8 56 W	10 19	J. T. Gardner
Williams	43 10	75 13	1879.6	8 58 W	10 21	Do.
New Pr. Line, L. Ontario	43 10	76 58	1795.5	2 10 W	7 33	B. Ellicott
Lockport	43 10	78 44	1895	4 05 W	4 28	County surveyor
Lockport to Olcott	43 14	78 45	1900.0	5 30 W	5 36	R. R. engineers
Rome	43 14	75 28	1879.5	7 52 W	9 18	J. T. Gardner
High Dune	43 15	75 04	1883.6	9 27 W	10 33	V. Colvin
Vienna	43 15	75 41	1879.5	8 24 W	9 50	J. T. Gardner
Jerseyfield Lake	43 16	74 44	1883.5	8 50.5 W	9 57	V. Colvin
Charlotte	43 16	77 36	1894.5	6 48 W	7 16	Wm. P. Judson
Great Sodus Bay	43 16	76 58	1894.4	11 30 W	11 57	Do.
Pultneyville	43 16	77 11	1875.4	5 23 W	7 12	Do.
Lyon Point	43 16	77 26	1875.4	6 04 W	7 53	F. Terry
Holland Land Company	43 16	78 43	1799.5	0 30 W	5 57	S. Benton, jr.

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

NEW YORK—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*E or W* ° ′	*West* ° ′	
Niagara River, mouth	43 16	79 04	1875.5	3 41 W	5 30	F. M. Towar
Luzerne	43 17	73 50	1883.6	10 55 W	12 01	V. Colvin
6 m. W. of Little Sodus	43 18	76 49	1874.8	6 50 W	8 41	J. Eisenmann
East Porter	43 18	78 55	1875.4	3 16 W	5 05	Do.
Wilson	43 19	78 50	1873.4	3 38 W	5 38	Wm. P. Judson
Little Sodus	43 19	76 43	1875.5	6 35 W	8 24	Do.
Services Patent, NE. cor.	43 20	75 05	1899.6	10 11.1 W	10 18	State surveyor
Morehouseville	43 20	74 45	1883.6	8 23 W	9 29	V. Colvin
Braddock Point	43 20	78 43	1875.4	4 48? W	6 37	A. C. Lamson
Olcott Harbor	43 20	78 43	1875.5	3 40 W	5 29	Do.
Lake Ontario	43 21	78 01	1799.5	1 00 W	6 27	
Oak Orchard	43 22	78 12	1875.5	3 46 W	5 35	F. Terry
Stony Creek	43 23	73 51	1883.6	11 10 W	12 16	V. Colvin
South of Thurman	43 24	73 50	1883.6	11 30 W	12 36	Do.
Piseco Lake	43 24	74 33	1883.6	11 01 W	12 07	Do.
Meyer Hill	43 26	75 04	1883.5	7 00 W	8 07	Do.
Thurman	43 27	73 48	1883.6	11 20 W	12 26	Do.
Oswego	43 28	76 31	1875.5	6 32 W	8 21	Wm. P. Judson
Beekman Corner	43 29	74 46	1900.5	9 53.4 W	.. ..	Do.
Warrensburg, near	43 30	73 44	1883.6	11 00 W	12 06	V. Colvin
Herkimer-Hamilton counties	43 32	74 47	1900.5	10 12 W	10 17	C. H. Flanigan, mean, 24 stations
The Glen	43 33	73 51	1883.6	13 07 W	14 13	V. Colvin
Port Ontario	43 34	76 12	1874.7	8 09 W	9 57	F. M. Towar
Johnsburg	43 36	73 57	1883.6	10 42 W	11 48	V. Colvin
West Canada Lakes	43 36	74 36	1772.5	6 54.2 W	11 57	
Horicon	43 36	73 45	1883.6	10 32 W	11 38	Do.
Gommer Hill	43 37	75 26	1883.5	8 52 W	10 02	Do.
Starbuckville	43 38	73 45	1883.6	10 32 W	11 38	Do.
Riverside	43 38	73 52	1883.6	9 55 W	11 01	Do.
Herkimer-Hamilton counties	43 38	74 48	1900.5	10 41 W	10 46	C. H. Flanigan, mean, 36 sta.
Schroon Lake, near outlet	43 41	73 48	1883.6	9 46 W	10 52	V. Colvin
Sandy Creek	43 42	76 12	1874.7	7 50 W	9 39	F. Terry
Herkimer-Hamilton counties	43 47	74 48	1900.6	10 43 W	10 47	C. H. Flanigan, mean, 34 sta.
Lowville	43 48	75 30	1821.5	4 30 W	9 49	J. Clark
Stony Creek	43 49	76 16	1874.7	8 23 W	10 12	J. Eisenmann
North Creek	43 50	73 58	1883.6	11 34 W	12 40	V. Colvin
Big Moose Lake	43 51	74 49	1900.6	10 41 W	10 45	Wm. P. Judson
Stony Island	43 52	76 20	1874.5	6 18 W	8 08	J. Eisenmann
Snowshoe Bay	43 53	76 14	1874.7	7 20 W	9 09	Do.
Herkimer-Hamilton counties	43 54	74 49	1900.7	10 20 W	10 24	C. H. Flanigan, mean. 33 sta.
Gallop Island	43 54	76 25	1874.6	7 28 W	9 17	J. Eisenmann
Crown Point	43 55	73 27	1838.5	8 47 W	13 07	Regents' Report
Sackett's Harbor	43 57	76 08	1895.5	9 59 W	10 21	Wm. P. Judson
Peninsula Point	43 58	76 16	1874.7	8 17 W	10 06	J. R. Mayer
Herkimer-Hamilton counties	44 01	74 49	1900.7	11 05 W	11 09	C. H. Flanigan, mean, 32 sta.
Near the mountain	44 01	73 50	1838.5	8 16 W	12 36	Geological Report
West Moriah	44 01	73 41	1838.5	7 01 W	11 21	Do.
Le Royville	44 01	75 44	1826.4	5 45.0 W	10 48	
Crown Point	44 02	73 25	1879.5	9 37.3 W	10 51	V. Colvin
Small Pond	44 03	73 37	1838.5	7 18 W	11 39	Geological Report

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

NEW YORK—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*E or W* ° ′	*West* ° ′	
East Moriah	44 03	73 31	1838.5	10 10 W	14 30	Geological Report
Cedar Point	44 03	73 29	1838.5	9 28 W	13 48	Do.
Mount Dix	44 05	73 47	1879.5	9 57.6 W	11 12	V. Colvin
Bald Peak	44 06	73 29	1879.5	11 59.3 W	13 13	Do.
Litchfield Park	44 07	74 28	1898.5	10 58 W	11 09	W. G. Raymond
Mount Marcy	44 07	73 55	1879.5	10 42.5 W	12 00	V. Colvin
Jefferson County	44 09	75 37	1794.6	2 40 W	8 12	P. Pharoux
Keene Valley	44 10	73 46	1883.5	8 02.6 W	9 09	V. Colvin
Clear Pond	44 10	73 57	1883.7	9 50 W	10 56	Do.
Mount Hurricane	44 14	73 42	1879.5	9 09.2 W	10 24	Do.
Moosehead Mountain	44 14	74 38	1883.6	9 24 W	10 30	Do.
Elizabethtown	44 15	73 36	1900.0	12 58 W	13 04	J. W. Steele
Plessis	44 16	75 55	1858.4	7 35 W	10 40	J. Clark
Upper Saranac Lake	44 19	74 15	1883.6	10 47 W	11 53	V. Colvin
Alexandria Bay	44 20	75 56	1872.7	7 00 W	8 58	A. C. Lamson
Dial Mountain	44 21	73 49	1838.5	8 20.5 W	12 45	Geological Report
Wellesley Island	44 21	76 01	1873.6	8 35 W	10 29	F. M. Towar
Whiteface Mountain	44 22	73 54	1879.5	10 59.6 W	12 23	V. Colvin
Rossie	44 22	75 43	1839.5	6 43 W	10 07	A. Hopkins
Picnic Island	44 22	75 52	1872.8	7 56 W	9 46	F. M. Towar
Bog Mountain	44 23	74 44	1883.6	5 57 W	7 03	V. Colvin
St. Regis Lake	44 24	74 14	1883.6	10 11 W	11 17	Do.
St. Regis Mountain	44 24	74 20	1879.5	10 31 W	11 54	Do.
Raquette River	44 25	74 45	1883.6	10 07 W	11 13	Do.
Keeseville	44 28	73 32	1838.5	8 40 W	13 00	Geological Report
Mount Azure	44 28	74 28	1883.7	9 39 W	10 45	V. Colvin
Chippewa Point	44 29	75 46	1872.6	7 42 W	9 34	F. M. Towar
Colton Village	44 32	74 54	1883.6	9 34 W	10 40	V. Colvin
Oak Point, 2 miles NE.	44 32	75 43	1872.6	11 00 W	12 52	A. C. Lamson
Norway Mountain	44 34	73 41	1879.5	12 16.0 W	13 39	V. Colvin
Ogdensburg, 4 miles SW.	44 40	75 33	1871.8	9 36 W	11 35	A. C. Lamson
Lyon Mountain	44 42	73 52	1879.5	12 26.5 W	13 50	V. Colvin
Ragged Lake	44 42	74 00	1883.7	14 58 W	16 04	Do.
Plattsburg	44 45	73 24	1870.8	10 52 W	12 50	J. L. Gillespie
Rand Hill	44 46	73 36	1879.5	11 20.3 W	12 40	V. Colvin
La Motte	44 50	73 25	1879.5	13 21.6 W	14 40	Do.
Malone	44 50	74 15	1883.6	12 28 W	13 34	Do.
West Chazy	44 52	73 25	1838.5	9 21 W	13 41	Geological Report
Goose Neck Island	44 55	75 07	1871.4	9 39 W	11 40	A. C. Lamson
St. Regis, Indian Village	44 59	74 39	1883.7	10 30 W	11 36	V. Colvin
Champlain	45 00	73 26	1838.5	9 30 W	13 50	Geological Report
Massena Point	45 00	74 46	1871.5	10 37 W	12 37	A. C. Lamson

NORTH CAROLINA

Group I	° ′	° ′		*E or W* ° ′	*E or W* ° ′	
Southport	33 55	78 01	1898.59	1 50.4 W	1 59 W	J. B. Baylor
Wilmington	34 14	77 57	1898.58	1 50.2 W	1 59 W	Do.
Lake Waccamaw	34 18	78 33	1891.36	0 41.2 W	1 12 W	Do.
Whiteville	34 19	78 42	1899.90	1 43.8 W	1 50 W	Do.
Fair Bluff	34 19	79 01	1891.36	0 36.5 W	1 07 W	Do.

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

NORTH CAROLINA—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group I—Continued	° ′	° ′		*E or W* ° ′	*E or W* ° ′	
Burgaw	34 32	77 55	1899.52	1 28.8 W	1 36 W	J. B. Baylor
Elizabethtown	34 36	78 32	1899.89	1 37.8 W	1 44 W	Do.
Lumberton	34 36	78 58	1899.88	1 12.0 W	1 18 W	Do.
Beaufort	34 43	76 40	1898.31	2 36.3 W	2 46 W	C. C. Yates
Jacksonville	34 44	77 22	1898.56	2 28.8 W	2 38 W	J. B. Baylor
Laurinburg	34 47	79 28	1899.86	1 20.6 W	1 27 W	Do.
Rockingham	34 54	79 46	1899.57	1 24.0 W	1 31 W	Do.
Kenansville	34 58	77 58	1899.51	1 37.0 W	1 44 W	Do.
Wadesboro	34 58	80 04	1900.40	0 00.9 E	0 04 W	G. R. Putnam
Monroe	34 58	80 34	1899.58	0 15.8 W	0 23 W	J. B. Baylor
Warsaw	34 59	78 05	1891.39	1 34.9 W	2 06 W	Do.
Clinton	35 00	78 19	1899.50	1 33.3 W	1 40 W	Do.
Hayesville	35 02	83 49	1900.71	1 04.5 E	1 01 E	Do.
Fayetteville	35 03	78 52	1899.41	1 41.7 W	1 49 W	Do.
Portsmouth Island	35 04	76 03	1871.25	2 22.0 W	4 04 W	A. T. Mosman
Trenton	35 04	77 21	1900.85	2 54.6 W	2 58 W	J. B. Baylor
Murphy	35 05	84 03	1898.73	2 18.2 E	2 08 E	Do.
Newbern	35 07	77 03	1898.52	2 46.6 W	2 56 W	Do.
Bayboro	35 08	76 45	1898.53	2 43.2 W	2 53 W	Do.
Franklin	35 11	83 23	1898.74	1 36.3 E	1 26 E	Do.
Charlotte	35 13	80 51	1899.61	0 23.5 W	0 31 W	Do.
Brevard	35 14	82 44	1898.78	0 27.8 E	0 18 E	Do.
Columbus	35 15	82 10	1900.77	0 05.5 W	0 10 W	Do.
Kinston	35 16	77 35	1899.38	1 50.9 W	1 58 W	Do.
Cape Hatteras L. H.	35 16	75 32	1898.45	3 53.0 W	4 03 W	Do.
Shelby	35 17	81 33	1899.63	0 05.4 W	0 13 W	Do.
Dallas	35 19	81 13	1900.78	0 06.2 W	0 10 W	Do.
Hendersonville	35 19	82 28	1900.76	0 08.4 W	0 12 W	Do.
Carthage	35 20	79 25	1899.55	1 16.2 W	1 23 W	Do.
Robbinsville	35 20	83 47	1900.70	1 41.8 E	1 38 E	Do.
Webster	35 21	83 14	1898.76	1 43.0 E	1 33 E	Do.
Lillington	35 22	78 47	1899.92	1 59.4 W	2 05 W	Do.
Troy	35 22	79 52	1899.77	1 26.3 W	1 32 W	Do.
Albemarle	35 22	80 12	1900.82	1 10.1 W	1 14 W	Do.
Rutherfordton	35 22	81 57	1899.64	0 15.6 W	0 23 W	Do.
Goldsboro	35 23	77 59	1899.40	1 50.3 W	1 57 W	Do.
Swanquarter	35 24	76 19	1898.46	3 18.9 W	3 28 W	Do.
Concord	35 24	80 35	1899.65	2 48.8 W	2 56 W	Do.
Bryson City	35 25	83 27	1898.71	0 55.5 E	0 45 E	Do.
Snowhill	35 28	77 37	1899.48	3 26.0 W	3 33 W	Do.
Lincolnton	35 28	81 16	1899.61	0 35.8 W	0 43 W	Do.
Waynesville	35 30	82 59	1900.69	0 38.8 E	0 35 E	Do.
Smithfield	35 32	78 21	1899.43	0 56.8 W	1 04 W	Do.
Washington	35 33	77 03	1898.48	2 44.0 W	2 54 W	Do.
Chicamicomico	35 35	75 28	1898.44	3 52.3 W	4 02 W	Do.
Asheville	35 35	82 32	1898.67	0 13.4 E	0 03 E	Do.
Greenville	35 36	77 22	1898.50	2 33.5 W	2 43 W	Do.
Salisbury	35 39	80 32	1898.63	0 38.5 W	0 48 W	Do.
Newton	35 40	81 13	1900.79	0 15.6 W	0 20 W	Do.
Marion	35 40	82 01	1898.64	0 53.6 W	1 04 W	Do.
Ashboro	35 42	79 49	1899.75	1 58.8 W	2 05 W	Do.
Pittsboro	35 43	79 11	1899.54	2 35.0 W	2 41 W	Do.
Wilson	35 44	77 55	1899.37	1 59.6 W	2 07 W	Do.
Morganton	35 44	81 41	1900.67	0 27.7 W	0 32 W	Do.
Statesville	35 47	80 53	1899.67	0 50.5 W	0 58 W	Do.

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

NORTH CAROLINA—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group I—Continued	° ′	° ′		*E or W* ° ′	*E or W* ° ′	
Marshall	35 47	82 40	1898.69	0 14.6 E	0 04 E	J. B. Baylor
Bodies Island	35 48	75 32	1846.99	1 13.4 W	4 25 W	C. O. Boutelle
Jamesville	35 48	76 52	1891.44	2 09.2 W	2 40 W	J. B. Baylor
Raleigh	35 48	78 36	1899.44	2 27.1 W	2 34 W	Do.
Sand Island	35 50	75 40	1876.08	.. ....	4 23 W	E. Smith
Williamston	35 50	77 02	1899.93	3 05.3 W	3 11 W	J. B. Baylor
Lexington	35 50	80 16	1900.83	0 04.9 W	0 08 W	Do.
Plymouth	35 52	76 44	1898.36	3 26.9 W	3 37 W	Do.
Mocksville	35 53	80 34	1900.81	1 18.3 W	1 22 W	Do.
Tarboro	35 54	77 37	1899.34	3 33.2 W	3 40 W	Do.
Chapelhill	35 54	79 03	1898.23	1 28.6 W	1 39 W	Do.
Lenoir	35 54	81 32	1900.66	0 36.5 W	0 41 W	Do.
Burnsville	35 54	82 17	1900.73	0 01.3 E	0 03 W	Do.
Manteo	35 55	75 40	1898.44	4 22.2 W	4 32 W	Do.
Columbia	35 55	76 15	1899.26	4 01.1 W	4 08 W	Do.
Taylorsville	35 55	81 10	1900.80	0 36.6 W	0 41 W	Do.
Windsor	35 56	76 59	1898.37	4 29.6 W	4 40 W	Do.
Rockymount	35 56	77 48	1900.41	2 30.2 W	2 35 W	J. A. Fleming
Nashville	35 58	77 58	1899.36	1 42.2 W	1 49 W	J. B. Baylor
Bakersville	36 01	82 09	1900.74	0 40.8 W	0 45 W	Do.
Louisburg	36 03	78 19	1899.95	2 24.1 W	2 30 W	Do.
Durham	36 03	78 55	1898.27	1 18.9 W	1 30 W	Do.
Poore	36 03	81 09	1895.68	0 25.7 W	0 46 W	A. H. Buchanan
Shellbank	36 04	75 44	1847.24	1 44.8 W	4 56 W	Boutelle, Davidson
Edenton	36 04	76 36	1898.38	3 29.2 W	3 39 W	J. B. Baylor
Hillsboro	36 04	79 05	1898.28	2 03.9 W	2 15 W	Do.
Graham	36 04	79 24	1899.97	2 02.9 W	2 08 W	Do.
Greensboro	36 04	79 49	1899.73	0 50.3 W	0 56 W	Do.
Stevenson Point	36 06	76 11	1847.10	1 39.6 W	4 51 W	C. O. Boutelle
Winston-Salem	36 06	80 15	1899.69	1 42.9 W	1 50 W	J. B. Baylor
Roan High Bluff	36 06	82 09	1894.81	0 33.4 E	0 11 E	A. H. Buchanan
Yadkinville	36 08	80 39	1900.61	1 02.6 W	1 07 W	J. B. Baylor
Wilkesboro	36 09	81 09	1899.71	0 29.7 W	0 37 W	Do.
Hertford	36 11	76 28	1899.25	3 15.1 W	3 22 W	Do.
Boone	36 13	81 41	1900.65	0 39.7 W	0 44 W	Do.
Elizabeth City	36 18	76 13	1898.40	4 14.4 W	4 24 W	Do.
Oxford	36 18	78 38	1898.32	2 00.5 W	2 11 W	Do.
Camden	36 19	76 12	1900.88	4 21.9 W	4 25 W	Do.
Halifax	36 19	77 38	1899.33	2 00.0 W	2 07 W	Do.
Henderson	36 22	78 22	1899.94	2 32.0 W	2 37 W	Do.
Gatesville	36 23	76 48	1899.28	3 45.2 W	3 52 W	Do.
Jackson	36 23	77 29	1899.31	3 11.1 W	3 18 W	Do.
Roxboro	36 23	78 59	1898.30	2 11.4 W	2 22 W	Do.
Winton	36 24	76 59	1899.29	3 15.8 W	3 23 W	Do.
Warrenton	36 24	78 09	1898.34	2 25.2 W	2 35 W	Do.
Yanceyville	36 24	79 22	1900.58	2 00.0 W	2 04 W	Do.
Wentworth	36 24	79 47	1899.74	1 57.7 W	2 04 W	Do.
Jefferson	36 24	81 28	1900.64	0 43.1 W	0 47 W	Do.
Danbury	36 26	80 12	1900.60	2 23.1 W	2 27 W	Do.
Currituck	36 27	76 01	1898.41	4 46.1 W	4 56 W	Do.
Weldon	36 27	77 38	1887.24	2 30.8 W	3 15 W	Do.
Mountairy	36 30	80 37	1899.70	1 13.0 W	1 19 W	Do.
Sparta	36 31	81 09	1900.62	0 39.9 W	0 44 W	Do.
Nottaway R., Riddicksville	36 32	76 56	1887.17	2 30.1 W	3 15 W	C. H. Sinclair
N. C. and Va. B., Knott Id.	36 33	75 56	1887.06	3 33.2 W	4 18 W	Do.
N. C. and Va. bound'y, NW.	36 33	76 12	1886.99	2 54.0 W	3 40 W	Do.

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

NORTH CAROLINA—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II	° ′	° ′		*E or W* ° ′	*E or W* ° ′	
Red Springs	34 51	79 12	1901	1 20 W	1 22 W	J. E. Purcell
Sladesville	35 26	76 28	1901.5	3 28 W	3 29 W	J. H. Wahab
Wimble Shoals	35 34	75 24	1738.5	4 00 W	.. ..	
Rolesville	35 54	78 29	1895	1 30 W	1 49 W	County surveyor
Ellendale	35 54	81 16	1896	0 45 E	0 30 E	Do.
Coinjock	36 18	76 00	1874	2 45 W	4 15 W	Do.

NORTH DAKOTA

				East ° ′	*East* ° ′	
Group I	° ′	° ′				
Bismarck, C. H. Grounds	46 48	100 47	1890.58	15 14.9	14 33	R. A. Marr
Jamestown	46 54	98 43	1896.43	12 27.5	12 03	R. L. Faris
Dickinson	46 54	102 44	1896.44	16 11.7	15 53	Do.
Williston	48 09	103 38	1896.52	16 57.7	16 39	Do.
Rugby	48 22	99 56	1896.53	13 43.8	13 22	Do.
Pembina	48 58	97 14	1896.54	11 20.0	10 55	Do.
Group II						
Sargent County	.. ..	.. ..	1882	12 47	11 34	Mean, 24 stations
Dickey County	.. ..	.. ..	1883	13 27	12 17	Mean, 32 stations
McIntosh County	.. ..	.. ..	1884	14 10	13 03	Mean, 28 stations
Emmons County	.. ..	.. ..	1884	15 16	14 14	Mean, 45 stations
Richland County	.. ..	.. ..	1873	13 21	11 36	Mean, 37 stations
Hettinger County	.. ..	.. ..	1891	16 08	15 32	Mean, 13 stations
Lisbon	46 26	97 40	1892	11 30	10 53	County surveyor
Ransom County	.. ..	.. ..	1878	13 19	11 53	Mean, 28 stations
Lamoure County	.. ..	.. ..	1881	13 41	12 24	Mean, 32 stations
Logan County	.. ..	.. ..	1883	14 32	13 22	Mean, 28 stations
Morton County	.. ..	.. ..	1884	16 01	15 05	Mean, 52 stations
Billings County	.. ..	.. ..	1885	16 55	16 01	Mean, 3 stations
Stark County	.. ..	.. ..	1883	16 53	15 52	Mean, 26 stations
Fargo	46 53	96 47	1898.7	11 03	10 50	G. T. Hawkins
Cass County	.. ..	.. ..	1874	13 30	11 46	Mean, 45 stations
Barnes County	.. ..	.. ..	1875	13 37	11 59	Mean, 42 stations
Stutsman County	.. ..	.. ..	1875	14 38	13 00	Mean, 63 stations
Kidder County	.. ..	.. ..	1878	14 57	13 38	Mean, 40 stations
Burleigh County	.. ..	.. ..	1881	15 11	14 00	Mean, 47 stations
Oliver County	.. ..	.. ..	1882	15 56	14 50	Mean, 21 stations
Williams County	.. ..	.. ..	1887	16 04	15 16	Mean, 15 stations
Dunn County	.. ..	.. ..	1884	16 45	15 49	Mean, 2 stations
Mercer County	.. ..	.. ..	1885	15 50	14 56	Mean, 13 stations
Carrington	47 27	99 07	1898.6	13 00	12 47	G. T. Hawkins
Foster County	.. ..	.. ..	1883	14 16	13 06	Mean, 18 stations
Near Fort Berthold	47 28	101 50	1860.5	18 58	17 20	W. F. Raynolds
McLean County	.. ..	.. ..	1883	16 15	15 11	Mean, 21 stations
Griggs County	.. ..	.. ..	1881	13 30	12 13	Mean, 20 stations
Steele County	.. ..	.. ..	1878	13 25	11 59	Do.
Traill County	.. ..	.. ..	1874	13 34	11 52	Do.
Sheridan County	.. ..	.. ..	1886	15 32	14 37	Mean, 6 stations
Wells County	.. ..	.. ..	1885	14 32	13 32	Mean, 31 stations
New Rockford	47 41	99 08	1898.6	13 22	13 09	G. T. Hawkins

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

NORTH DAKOTA—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Eddy County	.. ..	.. ..	1882	14 17	13 04	Mean, 18 stations
Garfield County	.. ..	.. ..	1888	15 35	14 50	1 station
Stevens County	.. ..	.. ..	1886	15 49	14 54	Mean, 5 stations
Church County	.. ..	.. ..	1885	15 28	14 28	Mean, 4 stations
Nelson County	.. ..	.. ..	1882	13 33	12 20	Mean, 28 stations
Grand Forks County	.. ..	.. ..	1877	13 54	12 20	Mean, 38 stations
Grand Forks	47 56	97 04	1898.6	10 45.5	10.32	G. T. Hawkins
Fort Totten	47 58	98 57	1880	14 30	13 10	County surveyor
Lakota	48 02	98 20	1898.6	12 38.5	12 25	G. T. Hawkins
Minnewaukan	48 04	99 15	1898.6	14 31	14 18	Do.
Benson County	.. ..	.. ..	1886	14 19	13 20	Mean, 36 stations
Devils Lake	48 07	98 53	1898.6	14 06	13 53	G. T. Hawkins
Pierce County	.. ..	.. ..	1895	14 03	13 39	Mean, 28 stations
Ward County	.. ..	.. ..	1887	16 06	15 15	Mean, 22 stations
McHenry County	.. ..	.. ..	1886	15 10	14 15	Mean, 29 stations
Ramsey County	.. ..	.. ..	1885	13 37	12 34	Mean, 33 stations
Walsh County	.. ..	.. ..	1881	13 35	12 15	Mean, 32 stations
Towner County	.. ..	.. ..	1885	14 15	13 12	Mean, 31 stations
Cavalier County	.. ..	.. ..	1885	13 40	12 37	Mean, 48 stations
Pembina County	.. ..	.. ..	1871	14 00	12 10	Mean, 30 stations
Rolette County	.. ..	.. ..	1884	14 35	13 29	Mean, 22 stations
Renville County	.. ..	.. ..	1893	16 16	15 45	
Bottineau County	.. ..	.. ..	1887	16 05	15 13	Mean, 13 stations
Canada Boundary	49 00	97 40	1872.5	15 00	13 12	W. J. Twining
Canada B., n'r Pembina Mts.	49 00	98 00	1872.5	15 10	13 24	Do.
Canada Boundary	49 00	98 10	1872.5	15 30	13 45	Do.
Do.	49 00	98 30	1872.5	15 32.5	13 50	Do.
Do.	49 00	98 45	1872.5	15 15	13 33	Do.
Do.	49 00	98 55	1872.5	15 40	14 00	Do.
Do.	49 00	99 02	1872.5	15 50	14 10	Do.
Do.	49 00	100 28	1873.6	16 57.5	15 28	Do.
Do.	49 00	100 40	1873.6	17 10	15 42	Do.
Do.	49 00	101 10	1873.6	17 45	16 20	Do.
Do.	49 00	102 00	1873.6	18 00	16 38	Do.
Do.	49 00	102 15	1873.6	18 11	16 51	Do.
Do.	49 00	103 00	1873.6	18 00	16 44	Do.
Do.	49 00	103 30	1873.7	18 08	16 55	Do.

OHIO

Group I	° ′	° ′		*E or W* ° ′	*E or W* ° ′	
South Point	38 25	82 35	1864.14	1 52.9 E	0 36 W	A. T. Mosman
Portsmouth	38 45	82 59	1900.51	2 17.1 W	2 22 W	J. W. Miller
Cincinnati	39 08	84 25	1899.64	1 06.2 E	0 58 E	Vehrenkamp
Athens	39 20	82 06	1898.44	0 22.2 W	0 35 W	E. Smith
Chillicothe	39 20	82 59	1900.52	0 33.6 W	0 39 W	J. W. Miller
Marietta	39 25	81 28	1898.45	2 01.4 W	2 14 W	E. Smith
Washington	39 34	83 25	1900.53	0 31.2 W	0 36 W	J. W. Miller
Dayton, National Mil. Home	39 46	84 15	1900.49	0 07.6 E	0 02 E	Fleming & Wallis
Columbus	39 59	83 01	1900.48	0 43.6 W	0 49 W	J. A. Fleming
Newark	40 04	82 26	1900.48	0 33.1 E	0 28 E	Do.

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

OHIO—Continued

Station	Latitude	Longitude	Date of observation	Declination observed.	Declination in 1902	Observer or authority
Group I—Continued	° ′	° ′		*E or W* ° ′	*E or W* ° ′	
Bellefontaine	40 22	83 46	1900.53	0 07.8 E	0 03 E	J. W. Miller
Tuscarawas	40 24	81 24	1900.48	2 15.1 W	2 20 W	J. A. Fleming
Marion	40 34	83 07	1900.54	0 34.2 W	0 39 W	J. W. Miller
Ashland	40 54	82 20	1900.55	1 01.0 W	1 06 W	Do.
Akron	41 05	81 33	1900.57	2 25.2 W	2 30 W	Do.
Warren, S. M.	41 15	80 50	1900.59	3 12.7 W	3 18 W	Do.
Warren, N. M.	41 15	80 50	1900.59	2 13.6 W	2 19 W	Do.
Cleveland	41 30	81 42	1900.57	3 10.0 W	3 15 W	Do.
Jefferson	41 44	80 48	1900.58	3 05.4 W	3 10 W	Do.
Group II						
Ironton	38 35	82 37	1896	0 40 E	0 20 E	County surveyor
Portsmouth	38 45	82 59	1901.2	2 40 W	2 43 W	W. H W. Jenkins
Lyra	38 46	82 42	1895	0 44 W	1 08 W	County surveyor
Gallipolis	38 53	82 07	1838.5	1 35 E	1 14 W	J. Fletcher
Shyville	39 01	82 57	1901.2	2 00 W	2 03 W	G. O. Stewart
Jackson	39 04	82 36	1895	1 16 W	1 40 W	County surveyor
Waverly	39 08	82 58	1895	0 00	0 24 W	H. W. Overman
Miami River, mouth	39 08	84 45	1810.5	5 10 E	0 54 E	J. Mansfield
8 m. N. of Cincinnati	39 15	84 25	1873.8	2 40.7 E	0 49 E	G. B. Nicholson
Athens	39 20	82 06	1900.0	0 27 W	0 34 W	A. A. Atkinson
Hamilton	39 23	84 33	1895	0 44 E	0 20 E	J. C. Weaver
Lebanon	39 26	84 11	1891	1 37 E	0 58 E	P. O. Monfort
Wilmington	39 28	83 49	1838.5	4 05 E	0 16 E	D. Wickersham
Oxford	39 30	84 45	1845.6	4 50 E	1 19 E	J. Locke
Springboro	39 31	84 16	1838.5	4 04 E	0 15 E	E. Baily
Washington	39 34	83 21	1838.5	3 06 E	0 43 W	J. Bell
Circleville	39 36	82 53	1901.0	0 36 W	0 39 W	E. H. Fischer
Ridge	39 38	81 35	1895	1 15 W	1 39 W	County surveyor
Carrollton Station	39 38	84 09	1845.7	4 45.4 E	1 15 E	J. Locke
Montgomery County	.. ..	.. ..	1800	5 10 E	1 03 E	Mean, 10 stations
Lancaster	39 43	82 36	1901.2	1 50 W	1 53 W	A. E. Bretz
Preble County	.. ..	.. ..	1801	5 04 E	0 57 E	Mean, 8 stations
Springfield	39 54	83 47	1835.5	4 30 E	0 35 E	—— Dutton
New Madison	39 56	84 43	1838.5	4 51 E	1 02 E	J. Jaqua
Columbus	39 56	82 56	1900.4	0 27 W	0 33 W	Henry Maetzel
Batesville	39 58	81 18	1838.5	1 22 E	2 27 W	M. Atkinson
Zanesville	39 58	82 04	1838.5	2 30 E	1 19 W	J. Boyle
Miami County	.. ..	.. ..	1799	5 10 E	1 05 E	Mean, 5 stations
Greenville	40 07	84 38	1895	2 09 E	1 45 E	County surveyor
Darke County	.. ..	.. ..	1801	5 13 E	1 06 E	Mean, 16 stations
St. Clairsville	40 10	80 52	1838.5	2 31 E	1 18 W	J. C. Moore
Marysville	40 15	83 23	1895	1 00 E	0 36 E	County surveyor
Coshocton	40 17	81 52	1838.5	1 30 E	2 19 W	J. W. Sweeney
Shelby County	.. ..	.. ..	1807	4 57 E	0 43 E	Mean, 7 stations
Logan County	.. ..	.. ..	1832	3 50 E	0 11 W	1 station
Mount Vernon	40 24	82 30	1896	0 15 W	0 35 W	County surveyor
Steubenville	40 24	80 39	1900.4	1 33 W	1 39 W	Sam Huston
Dover	40 31	81 29	1838.5	1 50 E	1 59 W	H. V. Beeson
Morrow County	.. ..	.. ..	1811	3 17 E	0 59 W	Mean, 8 stations
Mercer County	.. ..	.. ..	1810	5 32 E	1 16 E	Mean, 4 stations
Anglaize County	.. ..	.. ..	1828	4 17 E	0 09 E	Mean, 8 stations
Wapakoneta	40 34	84 13	1883	1 14 E	0 02 E	County surveyor
Holmes County	.. ..	.. ..	1807	2 52 E	1 22 W	Mean, 3 stations
Marion County	.. ..	.. ..	1830	4 17 E	0 12 E	Mean, 11 stations

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

OHIO—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*E or W* ° ′	*E or W* ° ′	
Carrollton	40 36	81 06	1895	2 15 W	2 39 W	County surveyor
Sandyville	40 37	81 22	1810.5	2 10 E	2 06 W	E. Buckingham
Kenton	40 39	83 37	1838.5	5 17 E	1 28 E	J. H. Ross
Hardin County	.. ..	.. ..	1820	5 03 E	0 47 E	Mean, 10 stations
Allen County	.. ..	.. ..	1832	3 55 E	0 06 W	Mean, 5 stations
Mansfield	40 47	82 31	1894	1 27 W	1 55 W	County surveyor
Lisbon	40 47	80 48	1895	2 30 W	2 54 W	Do.
Wooster	40 49	81 58	1840.5	1 47 E	1 58 W	C. W. Christmas
New Lisbon	40 50	80 49	1880.5	1 29.1 W	2 53 W	J. B. Strawn
Forest	40 50	83 28	1874.6	2 18.3 E	0 30 E	F. E. Hilgard
Ashland County	.. ..	.. ..	1807	3 34 E	0 40 W	Mean, 8 stations
Crawford County	.. ..	.. ..	1822	3 29 E	0 45 W	Mean, 11 stations
Wyandot County	.. ..	.. ..	1824	4 21 E	0 09 E	Mean, 6 stations
Van West County	.. ..	.. ..	1820	4 55 E	0 39 E	Mean, 5 stations
Pa. line, 75 m. S. of L. Erie	40 53	80 31	1880.4	1 55 W	3 19 W	J. B. Strawn
Chippewa	40 55	81 48	1810.5	2 36 E	1 40 W	J. Mansfield
Kalida	40 59	84 14	1838.5	3 00 E	0 49 W	E. B. Fitch
Poland	41 00	80 31	1810.5	1 21 E	2 55 W	J. Mansfield
Canfield	41 00	80 50	1810.5	1 37 E	2 39 W	Do.
Berlin	41 00	81 03	1810.5	1 48 E	2 28 W	Do.
Atwater	41 00	81 11	1810.5	2 04 E	2 12 W	Do.
Portage	41 00	81 31	1838.5	1 15 E	2 34 W	—— Mallison
Suffield	41 00	81 22	1810.5	2 22 E	1 54 W	J. Mansfield
Coventry	41 00	81 48	1810.5	2 19 E	1 57 W	Do.
Norton	41 00	81 53	1810.5	2 30 E	1 46 W	Do.
Putnam County	.. ..	.. ..	1825	4 20 E	0 09 E	Mean, 7 stations
Ottawa	41 02	84 03	1895	0 00	0 24 W	J. D. Huddle
Hancock County	.. ..	.. ..	1821	4 30 E	0 15 E	Mean, 17 stations
Akron	41 05	81 33	1901	2 15 W	2 18 W	J. A. Gehres
Tallmadge	41 06	81 28	1806.5	1 00 E	3 13 W	S. S. Ensign
Youngstown	41 07	86 40	1796.6	1 27 E	2 32 W	A. Spofford
Tiffin	41 08	83 11	1895	0 05 E	0 19 W	County surveyor
Paulding County	.. ..	.. ..	1822	4 48 E	0 34 E	Mean, 10 stations
Seneca	41 09	83 11	1810.5	3 57 E	0 19 W	J. Mansfield
4 miles north of Akron	41 10	81 33	1797.5	2 02 E	1 59 W	M. Warren
Medina	41 12	81 53	1900.1	1 45 W	1 52 W	L. B. Ganyard
Brookfield	41 14	80 37	1837.5	0 40 E	3 11 W	G. Boyse
Braceville	41 14	80 58	1838.5	0 50 E	2 59 W	F. E. Stowe
Hudson	41 15	81 26	1840.5	0 52 E	2 53 W	E. Loomis
Defiance	41 15	84 23	1810.5	4 30 E	0 14 E	J. Mansfield
Streetsboro	41 17	81 22	1821.4	2 05 E	2 10 W	R. Cowles
Flat Rock	41 18	84 12	1838.5	3 14 E	0 35 W	W. C. Brownell
Lorain County	.. ..	.. ..	1876	0 36 W	2 16 W	1 station
Henry County	.. ..	.. ..	1822	4 17 E	0 03 E	Mean, 9 stations
Defiance County	.. ..	.. ..	1822	4 30 E	0 16 E	Do.
Erie County	.. ..	.. ..	....	. ..	0 41 W	Mean, 8 stations
Lower Sandusky	41 21	83 09	1838.5	2 48 E	1 01 W	De Reeves
Sandusky County	.. ..	.. ..	1821	3 00 E	1 15 W	Mean, 19 stations
Aurora	41 23	81 18	1796.7	1 22 E	2 37 W	S. Pease
Huron	41 25	82 35	1877.4	0 29 E	1 08 W	F. Terry
Vermilion	41 26	82 21	1876.8	0 28 E	1 11 W	F. M. Towar
Sandusky	41 27	82 45	1872.4	0 55 E	1 02 W	A. C. Lamson
Kinsman	41 28	80 37	1796.6	1 30 E	2 29 W	S. Pease
Black River	41 28	82 10	1876.8	0 17 E	1 22 W	F. Terry
Pa. Line, 34 miles north	41 29	80 31	1796.6	1 37 E	2 22 W	M. Hallery

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

OHIO—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*E or W* ° ′	*E or W* ° ′	
Mesopotamia	41 29	81 00	1796.6	2 22 E	1 37 W	S. Pease
South Newbury	41 29	81 18	1796.6	1 20 E	2 39 W	Do.
Rocky River	41 29	81 52	1876.8	0 11 W	1 50 W	F. M. Towar
Sandusky, Sand Point	41 30	82 43	1877.4	0 37 E	1 00 W	A. C. Lamson
Rapids of Maumee	41 30	83 30	1810.5	2 48 E	1 28 W	J. Mansfield
Avon Point	41 31	82 01	1876.8	0 36 W	2 15 W	F. M. Towar
Port Clinton	41 31	82 58	1877.5	0 47 E	0 50 W	F. Terry
Mayfield	41 32	81 26	1796.7	1 03 E	2 56 W	S. Pease
Euclid	41 34	81 34	1876.7	1 10 W	2 49 W	F. Terry
Williams County	.. ..	.. ..	1822	4 36 E	0 22 E	Mean, 11 stations
Ottawa County	.. ..	.. ..	1821	3 50 E	0 25 W	Mean, 19 stations
Catawba Island	41 35	82 50	1877.5	0 40 E	0 56 W	A. C. Lamson
Chardon	41 35	81 15	1901	3 15 W	3 18 W	E. L. F. Phelps
Kelleys Island	41 36	82 44	1877.5	0 39 E	0 57 W	A. C. Lamson
Locust Point	41 36	83 06	1877.6	0 40 E	0 56 W	F. M. Towar
Fulton County	.. ..	.. ..	1823	4 20 E	0 07 E	Mean, 13 stations
Bass Islands	41 39	82 44	1846.3	2 23 E	1 06 W	Chart
Green Island	41 39	82 52	1845.6	2 34 E	0 57 W	J. C. Woodruff
Willoughby	41 40	81 26	1876.7	1 51 W	3 31 W	F. M. Towar
Toledo	41 40	83 34	1895	1 08 W	1 32 W	County surveyor
Kirtland	41 41	81 21	1796.7	1 00 E	3 00 W	S. Pease
Toledo	41 42	83 28	1901.7	1 08.1 W	1 09 W	T. Russell
North Bass Island	41 42	82 48	1877.4	1 13 E	0 24 W	F. M. Towar
Maumee R., E. side of mouth	41 42	83 26	1862.6	1 35 E	1 00 W	W. H. Hearding
Bloomfield	41 43	81 00	1796.6	2 00 E	2 00 W	S. Pease
Mentor	41 43	81 22	1796.7	1 50 E	2 10 W	M. Halley
Maumee Bay, Cedar Point	41 43	83 20	1877.6	0 10 W	1 46 W	A. C. Lamson
West Sister Island	41 44	83 06	1847.5	2 20 E	1 06 W	Chart
Fairport	41 45	81 16	1876.7	2 00 W	3 40 W	A. C. Lamson
Pa. Line, 14 m. S. of L. Erie	41 47	80 31	1796.5	0 53 E	3 06 W	A. Porter
Denmark	41 47	80 45	1796.7	1 30 E	2 30 W	M. Halley
Madison	41 47	81 02	1876.5	1 59 W	3 39 W	F. M. Towar
Pa. Line, 60 miles north	41 52	80 31	1796.6	1 53 E	2 07 W	M. Halley
Red Creek	41 53	80 51	1876.6	2 00 W	3 40 W	A. C. Lamson
Ashtabula	41 55	80 48	1876.5	1 46 W	3 26 W	Do.
North Kingsville	41 56	80 41	1876.5	1 16 W	2 56 W	F. M. Towar

OKLAHOMA

Group I	° ′	° ′		*East* ° ′	*East* ° ′	
Mangum	34 52	99 31	1900.93	10 14.6	10 11	W. C. Dibrell
Cheyenne	35 37	99 40	1900.92	10 34.9	10 31	Do.
Perry	36 16	97 20	1901.63	9 12.9	9 12	J. M. Kuehne
Woodward	36 27	99 23	1900.91	10 52.5	10 49	W. C. Dibrell
Beaver	36 49	100 30	1900.90	10 58.6	10 55	Do.
Group II						
K., C., and A. Res'n, SE.	.. ..	.. ..	1874	11 00	9 45	Mean, 24 stations
K., C., and A. Res'n, SW.	.. ..	.. ..	1875	11 14	10 01	Mean, 23 stations
K., C., and A. Res'n, NE.	.. ..	.. ..	1874	10 45	9 30	Mean, 10 stations
K., C., and A. Res'n, NW.	.. ..	.. ..	1874	10 58	9 43	Mean, 12 stations

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

OKLAHOMA—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Greer County	.. ..	.. ..	1874	11 18	10 03	Mean, 33 stations
Pottawatomie County	.. ..	.. ..	1873	10 00	8 43	Mean, 9 stations
Cleveland County	.. ..	.. ..	1872	11 10	9 51	Do.
Washita County	.. ..	.. ..	1874	11 06	9 51	Mean, 8 stations
I County	.. ..	.. ..	1873	10 32	9 15	Mean, 13 stations
Oklahoma	35 28	97 30	1895	9 25	9 04	County surveyor
Oklahoma County	.. ..	.. ..	1872	10 35	9 16	Mean, 14 stations
Canadian County	.. ..	.. .	1872	10 45	9 26	Mean, 10 stations
Roger Mills County	.. ..	.. ..	1874	11 40	10 25	Mean, 11 stations
G County	.. ..	.. ..	1874	10 52	9 37	Mean, 7 stations
Lincoln County	.. ..	.. ..	1877	11 06	9 57	Mean, 12 stations
Ind. Mer., T's 16 and 17 N.	35 54	97 14	1901.5	9 12	9 10	B. S. Reeves
Logan County	.. ..	.. ..	1871	10 38	9 17	Mean, 8 stations
Blaine County	.. ..	.. ..	1874	10 50	9 35	Mean, 9 stations
Day County	.. ..	.. ..	1874	11 27	10 12	Mean, 13 stations
Grand	35 58	99 48	1901.2	9 48	9 45	F. M. Sandford
Kingfisher County	.. ..	.. ..	1872	10 47	9 28	Mean, 10 stations
D County	.. ..	.. ..	1874	11 16	10 01	Do.
Payne County	.. ..	.. ..	1872	10 30	9 11	Mean, 7 stations
Stillwater	36 06	97 03	1896	9 45	9 27	County surveyor
Payne Co., 5th Par. and P.M.	36 15	97 14	1900.7	9 15	9 11	T. P. German
Pawnee County	.. ..	.. ..	1872	10 10	8 51	Mean, 6 stations
Noble County	36 18	97 18	1900.0	9 20	9 13	A. I. Thompson
Do.	.. ..	.. ..	1872	11 10	9 51	Mean, 9 stations
Garfield County	.. ..	.. ..	1872	10 56	9 37	Mean, 12 stations
Woods County	.. ..	.. ..	1873	11 20	10 03	Mean, 25 stations
Woodward County	.. ..	.. ..	1873	11 40	10 23	Mean, 30 stations
Osage Nation	.. ..	.. ..	1872	10 20	9 01	Mean, 23 stations
Beaver County, west	.. ..	.. ..	1891	11 52	11 20	Mean, 12 stations
Beaver County, middle	.. ..	.. ..	1891	11 50	11 18	Mean, 54 stations
Beaver County, east	.. ..	.. ..	1890	11 20	10 48	Mean, 60 stations
Grant County	.. ..	.. ..	1872	11 23	10 04	Mean, 13 stations
Kay County	.. ..	.. ..	1872	10 49	9 30	Mean, 9 stations

OREGON

Group I	° ′	° ′		*East* ° ′	*East* ° ′	
Jacksonville	42 18	122 58	1881.54	17 24.4	17 37	J. S. Lawson
Ewing Harbor	42 44	124 30	1851.89	18 29.7	19 51	G. Davidson
Canyonville	42 54	123 18	1881.55	17 48.5	18 02	J. S. Lawson
Loggie	43 21	124 10	1889.70	20 35	20 39	E. F. Dickins
Ross	43 21	124 11	1889.70	20 31	20 35	Do.
Fossil 2	43 21	124 19	1889.88	20 16	20 20	Do.
North Spit	43 22	124 20	1889.87	20 11	20 15	Do.
Pigeon 2	43 22	124 19	1889.85	20 06	20 10	Do.
Coos River Hill	43 22	124 10	1889.69	20 06	20 10	Do.
White Point 2	43 22	124 12	1889.79	19 07	19 11	Do.
Marshfield Hill	43 22	124 14	1889.78	18 06	18 10	Do.
Crawford 2	43 23	124 12	1889.68	19 21	19 25	Do.
Pierce	43 24	124 12	1889.68	17 28	17 32	Do.
Cemetery	43 24	124 17	1889.85	20 03	20 07	Do.

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

OREGON—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group I—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Empire 2	43 24	124 17	1889.85	20 01	20 05	E. F. Dickins
Pest	43 24	124 18	1889.87	20 06	20 10	Do.
Simpson	43 25	124 14	1889.76	19 11	19 15	Do.
North Bend 2	43 25	124 14	1889.68	18 44	18 48	Do.
Pony	43 25	124 16	1889.85	19 45	19 49	Do.
Hutchinson 2	43 25	124 17	1889.86	19 59	20 03	Do.
North Slough	43 26	124 15	1889.85	19 37	19 41	Do.
Mabry	43 26	124 13	1889.65	18 33	18 37	Do.
Oakland	43 26	123 18	1881.56	19 41.2	19 54	J. S. Lawson
Ten Mile Knoll	43 53	124 09	1887.45	20 52	20 59	E. F. Dickins
Cannery Hill	44 00	124 07	1887.47	21 24	21 31	Do.
Eugene	44 03	123 05	1881.56	20 48.1	21 01	J. S. Lawson
Mary Peak	44 31	123 29	1877.79	20 51.7	21 11	G. Davidson
Yaquina	44 36	124 01	1888.36	20 18.2	20 24	R. A. Marr
Albany	44 39	123 02	1881.57	21 42.0	21 55	J. S. Lawson
Yaquina Point Light-House	44 40	124 04	1885.33	20 50.6	21 00	F. Morse
Salem	44 56	122 58	1881.58	19 58.0	20 11	J. S. Lawson
Portland, Custom-House	45 31	122 41	1895.14	22 24.5	22 26	J. J. Gilbert
Portland	45 31	122 42	1900.89	22 24.0	22 24	W. Weinrich, jr.
Three Mile Creek, nr. Dalles	45 39	120 58	1881.78	21 02.8	21 02	J. S. Lawson
Blalock	45 44	120 22	1881.77	20 21.2	20 19	Do.
St. Helen	45 52	122 48	1881.62	19 08.0	19 21	Do.
Umatilla	45 57	119 20	1881.76	21 32.2	21 30	Do.
Rainier	46 05	122 56	1886.50	23 45.0	23 53	G. Davidson
Astoria	46 12	123 50	1881.61	22 26.4	22 39	J. S. Lawson
Group II						
California Boundary	42 00	120 06	1868.7	18 41	18 53	D. G. Major
Do.	42 00	120 38	1868.8	18 29	18 44	Do.
Do.	42 00	121 11	1868.8	18 11	18 29	Do.
Do.	42 00	122 15	1868.9	18 30	18 55	Do.
Do.	42 00	122 55	1868.9	19 07	19 36	Do.
Do.	42 00	123 37	1869.5	18 29	19 02	Do.
Klamath County, south	.. ..	.. ..	1893	19 15	19 15	Mean, 10 stations
Josephine County	.. ..	.. ..	1893	19 30	19 30	Mean, 2 stations
Jackson County	.. ..	.. ..	1893	19 20	19 20	Mean, 6 stations
Canyonville	42 54	123 18	1885.5	19 27	19 36	W. Thiel
Camp Harney	43 00	119 00	1876.1	18 23	18 26	Wainwright
Cape Blanco, near	43 06	124 18	1792.3	16 00	.. ..	G. Vancouver
Coos County	.. ..	.. ..	1884	19 40	19 50	Mean, 4 stations
Klamath County, north	.. ..	.. ..	1892	19 18	19 18	Mean, 7 stations
Roseburg	43 13	123 22	1896	20 07	20 08	W. P. Heydon
Douglas County	.. ..	.. ..	1890	19 17	19 21	Mean, 6 stations
Lake Watumpi	43 16	119 15	1859.5	18 10	18 39	J. Dixon
Stillwater Slough	43 25	118 48	1859.5	18 10	18 39	Do.
Harney County, northeast	.. ..	.. ..	1863	18 17	18 39	Mean, 4 stations
Oakland	43 26	123 18	1888.5	19 40	19 45	W. Thiel
Surprise Creek	43 37	118 38	1859.5	18 25	18 54	J. Dixon
Owyhee River Ford	43 47	117 03	1859.7	18 04	18 27	Do.
Malheur River, left bank	43 49	117 20	1859.5	18 15	18 38	Do.
Rock Creek Canyon	43 56	118 07	1859.5	18 30	18 58	Do.
Lane County, east	.. ..	.. ..	1901	18 30	18 30	C. M. Collier
Lane County, average	.. ..	.. ..	1901	20 40	20 40	Do.
Siuslaw River, mouth	43 57	124 10	1900	20 05	20 05	G. E. Bingham

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

OREGON—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Eugene	44 02	123 06	1901	21 20	21 20	C. M. Collier
Lane County, west	.. ..	... ..	1901	21 00	21 00	Do.
Crooked River Canyon	44 03	120 00	1859.5	18 40	19 20	J. Dixon
Birch Creek	44 16	117 26	1859.7	18 09	18 32	Do.
Prineville	44 17	120 52	1895	20 00	20 00	County surveyor
Waldport	44 23	124 05	1893	21 00	21 02	Do.
Linn County	.. ..	... ..	1891	20 30	20 33	Mean, 5 stations
Willow Creek	44 27	120 53	1859.5	18 55	19 39	J. Dixon
Grant County	.. ..	... ..	1895	20 00	20 00	County surveyor
Benton County	.. ..	... ..	1901	20 20	20 20	G. H. Waggoner
Corvallis	44 33	123 17	1895	20 00	20 02	George Mercer
Albany	44 37	123 06	1895	20 42	20 44	E. T. T. Fisher
Lincoln County	.. ..	... ..	1893	19 53	19 56	Mean, 6 stations
Cape Foulweather, near	44 42	124 07	1792.3	18 00	.. ..	G. Vancouver
Des Chutes River Crossing	44 47	121 06	1859.4	19 15	20 00	J. Dixon
Polk County	.. ..	... ..	1892	20 30	20 33	1 station
Marion County	.. ..	... ..	1890	20 22	20 26	Mean, 3 stations
Oak Grove Creek	45 06	121 15	1859.4	19 20	20 05	J. Dixon
Clackamas County	.. ..	... ..	1892	21 17	21 20	Mean, 4 stations
Gilliam County	.. ..	... ..	1888	21 07	21 07	Mean, 3 stations
McMinnville	45 13	123 10	1901	21 00	21 00	C. E. Branson
Wasco County	.. ..	... ..	1895	20 00	20 02	County surveyor
Grande Ronde Valley	45 16	117 43	1859.8	18 20	18 48	J. Dixon
Grande Ronde River	45 20	117 57	1859.8	19 00	19 28	Do.
Near Cape Lookout	45 20	124 00	1789.5	16 05	.. ..	J. Meares
Tillamook County	.. ..	... ..	1892	20 20	20 23	Mean, 5 stations
Tillamook	45 25	123 52	1895	21 54	21 56	A. M. Austin
Hillsboro	45 30	122 59	1895	21 30	21 32	L. E. Wilkes
Multnomah County	.. ..	... ..	1887	22 22	22 29	Mean, 2 stations
Wallowa County	.. ..	... ..	1893	20 00	19 56	1 station
Lees Camp, Blue M't'ns	45 33	118 21	1859.8	19 20	19 50	J. Dixon
Three Mile Creek	45 34	121 06	1859.4	19 45	20 30	Do.
The Dalles, 1 mile east	45 35	121 09	1900.6	21 29	21 29	W. Cuthbert
Umatilla County	.. ..	... ..	1866	20 20	20 36	Mean, 3 stations
Umatilla River	45 41	118 40	1859.8	20 02.5	20 32	J. Dixon
Vernonia	45 50	123 10	1895	22 30	22 32	County surveyor
Columbia County	.. ..	... ..	1893	21 20	21 22	Mean, 3 stations
Washington Boundary	46 01	118 25	1864.4	20 20	20 40	D. G. Major
Rainier	46 04	122 56	1895	21 40	21 42	County surveyor
Clatskanie	46 05	123 12	1895	21 45	21 47	Do.

PENNSYLVANIA

Group I	° ′	° ′		*E or W* ° ′	*E or W* ° ′	
Mason and Dixon Line	39 43	79 29	1897.79	3 47.5 W	4 02 W	L. A. Bauer
Gettysburg, S. M.	39 52	77 14	1901.80	4 53.4 W	4 54 W	J. W. Miller
Gettysburg, N. M.	.. ..	.. ..	1901.80	4 49.4 W	4 50 W	Do.
Waynesburg	39 54	80 12	1901.88	3 07.7 W	3 08 W	Do.
Uniontown, S. M.	39 54	79 43	1901.89	3 39.1 W	3 39 W	Do.
Uniontown, N. M.	.. ..	.. ..	1901.89	3 41.3 W	3 42 W	Do.
Westchester	39 55	75 35	1901.76	7 23.2 W	7 24 W	Do.

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

PENNSYLVANI .—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group I—Continued	° ′	° ′		*E or W* ° ′	*E or W* ° ′	
Chambersburg	39 56	77 39	1900.44	4 42.9 W	4 48 W	Fleming & Dibrell
Philadelphia, Hospital	39 57	75 12	1895.70	7 10.5 W	7 30 W	J. B. Baylor
Philadelphia, Girard Col.	39 58	75 10	1890.84	6 31.4 W	7 08 W	Do.
Yard	39 58	75 23	1854.82	6 42.3 W	10 04 W	J. E. Hilgard
York, S. M.	39 59	76 45	1901.79	6 17.9 W	6 18 W	J. W. Miller
York, N. M.	.. ..	.. ..	1901.80	6 00.2 W	6 01 W	Do.
Johnson Tavern	40 00	79 48	1862.58	1 13.6 W	3 52 W	C. A. Schott
Somerset	40 01	79 07	1901.89	4 39.2 W	4 40 W	J. W. Miller
Bedford	40 01	78 31	1902.56	4 31.5 W	4 30 W	Do.
Lancaster, S. M.	40 03	76 18	1901.76	6 16.2 W	6 17 W	Do.
Lancaster, N. M.	.. ..	.. ..	1901.77	6 07.8 W	6 08 W	Do.
Fannettsburg	40 03	77 48	1900.45	4 59.7 W	5 04 W	Fleming & Dibrell
Bristol, Vanuxem	40 07	74 53	1846.52	4 27.8 W	8 27 W	J. Locke
Hatboro	40 11	75 05	1900.50	7 26.2 W	7 30 W	W. C. Dibrell
Washington, S. M.	40 11	80 16	1901.87	3 22.8 W	3 23 W	J. W. Miller
Washington, N. M.	.. ..	.. ..	1901.87	3 44.4 W	3 45 W	Do.
Carlisle, S. M.	40 13	77 12	1901.81	5 19.7 W	5 20 W	Do.
Carlisle, N. M.	.. ..	.. ..	1901.81	5 20.7 W	5 21 W	Do.
Harrisburg, N. M.	40 16	76 53	1901.78	6 25.0 W	6 26 W	Do.
Harrisburg, S. M.	.. ..	.. ..	1901.78	6 19.8 W	6 20 W	Do.
Greensburg, S. M.	40 17	79 35	1901.86	4 06.4 W	4 07 W	Do.
Greensburg, N. M.	.. ..	.. ..	1901.86	4 09.9 W	4 10 W	Do.
Reading	40 18	75 56	1900.49	5 26.0 W	5 30 W	W. C. Dibrell
Andersonburg	40 21	77 27	1900.45	4 36.0 W	4 40 W	Fleming & Dibrell
Lebanon, S. M.	40 21	76 25	1901.77	6 34.7 W	6 35 W	J. W. Miller
Lebanon, N. M.	.. ..	.. ..	1901.78	6 30.2 W	6 31 W	Do.
Newport	40 27	77 07	1900.45	6 02.8 W	6 07 W	Fleming & Dibrell
Allegheny	40 28	80 01	1885.65	2 55.7 W	3 58 W	J. B. Baylor
Huntingdon	40 29	78 01	1900.46	5 29.0 W	5 33 W	Fleming & Dibrell
Ebensburg	40 29	78 44	1901.85	4 27.3 W	4 28 W	J. W. Miller
Altoona	40 31	78 23	1900.47	5 06.4 W	5 11 W	W. C. Dibrell
Lewistown	40 36	77 34	1900.46	5 19.7 W	5 24 W	Fleming & Dibrell
South Bethlehem	40 37	75 23	1874.47	5 19.5 W	7 07 W	T. C. Hilgard
Indiana, S. M.	40 39	79 12	1901.85	4 02.0 W	4 02 W	J. W. Miller
Indiana, N. M.	.. ..	.. ..	1901.86	3 59.6 W	4 00 W	Do.
Pottsville	40 41	76 12	1900.49	6 48.0 W	6 52 W	W. C. Dibrell
Middleburg	40 48	77 00	1901.81	6 05.8 W	6 06 W	J. W. Miller
Ingleby	40 49	77 26	1900.48	6 10.0 W	6 14 W	W. C. Dibrell
Bellefonte	40 55	77 47	1901.83	5 53.8 W	5 54 W	J. W. Miller
Lewisburg	40 56	76 52	1900.48	6 15.1 W	6 19 W	W. C. Dibrell
Clearfield, S. M.	41 03	78 26	1901.84	4 54.7 W	4 55 W	J. W. Miller
Clearfield, N. M.	.. ..	.. ..	1901.84	5 40.4 W	5 41 W	Do.
Lockhaven	41 09	77 26	1901.83	6 24.0 W	6 24 W	Do.
Williamsport, S. M.	41 14	77 02	1901.82	6 48.4 W	6 49 W	Do.
Williamsport, N. M.	.. ..	.. ..	1901.82	6 50.9 W	6 51 W	Do.
Erie	42 09	80 05	1885.70	3 08.2 W	4 10 W	J. B. Baylor
Group II						
Warren Point	39 43	78 02	1899.1	4 30 W	4 39 W	A. S. Winger
West B., ½ m. N. of S.W.cor.	39 44	80 31	1883.5	0 40 W	1 51 W	F. L. Hoge
Irwin Mill nr. Mercersburg	39 47	77 56	1840.6	0 54.4 W	5 04 W	A. D. Bache
West Boundary, 5 m. north	39 48	80 31	1785.4	2 03 E	2 08 W	A. Ellicott
Two m. s. of Rock Lick	39 52	80 31	1883.5	0 36 W	1 47 W	F. L. Hoge
West Boundary, 12 m. north	39 54	80 31	1883.4	0 36 W	1 47 W	Do.
McConnelsburg	39 55	77 59	1898.4	5 01 W	5 13 W	A. S. Winger

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

PENNSYLVANIA—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*E or W* ° ′	*E or W* ° ′	
Chambersburg	39 56	77 39	1901.3	4 55 W	4 57 W	Seven instruments
W. Boundary, abt. 16½ m. N.	39 57	80 31	1785.5	1 30 E	2 42 W	A. Ellicott
Milford station	39 58	79 07	1895	4 05 W	4 29 W	County surveyors
W. Boundary, 19 & 20 m. N.	39 59	80 31	1785.5	1 18.8 E	2 53 W	A. Ellicott
Upper Strasburg	40 03	77 41	1892.2	4 23 W	4 57 W	J. B. Kaufman
Greenfield	40 06	79 52	1874.6	2 02 W	3 50 W	F. E. Hilgard
West Boundary, 26 m. north	40 06	80 31	1785.5	1 17.5 E	2 54 W	A. Ellicott
Norristown	40 06	75 20	1892	6 42 W	7 13 W	County surveyor
Hopewell	40 07	78 17	1876.6	3 11 W	4 50 W	County surveyors
Norritonville	40 10	75 26	1770.5	3 08 W	7 34 W	W. Smith
Rices Hill nr. W. Alexander.	40 10	80 31	1883.4	1 11 W	2 23 W	F. L. Hoge
West Boundary, 37 m. north	40 15	80 31	1785.5	1 07.5 E	3 04 W	A. Ellicott
Frederick	40 16	75 27	1883.?	6 00 W	7 07 W	Phil. Water Dept.
Doylestown	40 18	75 10	1901.3	8 00 W	8 02 W	S. F. Long
Green Lane	40 20	75 27	1883.?	6 03 W	7 10 W	Phil. Water Dept.
Pleasant Run	40 20	75 82	1883.?	5 51 W	6 58 W	Do.
Johnstown	40 20	78 53	1875.7	2 20 W	4 03 W	County surveyors
West Boundary, 44½ m. N.	40 22	80 31	1883.4	1 49 W	3 00 W	F. L. Hoge
Plumstedville	40 23	75 08	1883?	6 39 W	7 46 W	Phila. Water Dept.
West Boundary, 47½ m. N.	40 24	80 31	1785.6	0 40 E	3 32 W	A. Ellicott
Point Pleasant	40 25	75 05	1883?	6 54 W	8 01 W	Phila. Water Dept.
Cresson	40 28	78 38	1895	3 08 W	3 30 W	County surveyor
Holidaysburg	40 28	78 23	1885.8	4 00 W	5 00 W	County surveyors
Pittsburg	40 28	80 01	1887.7	3 01 W	3 54 W	D. Carhart
West Boundary, 51 m. N.	40 28	80 31	1785.6	0 57.5 E	3 14 W	A. Ellicott
West Boundary, 53 m. N.	40 29	80 31	1785.6	0 50 E	3 22 W	Do.
Station	40 29	75 19	1883?	6 34 W	7 41 W	Phila. Water Dept.
West Boundary, 57 m. N.	40 33	80 31	1785.6	1 02.5 E	3 10 W	A. Ellicott
South Bethlehem	40 36	75 23	1894.7	6 55.4 W	7 19 W	M. Merriman
Allentown	40 36	75 28	1878.2	5 05 W	6 35 W	County surveyors
Leechburg	40 39	79 38	1896	3 15 W	3 35 W	County surveyor
Tyrone	40 40	78 16	1879.2	3 48 W	5 15 W	W. G. Waring
West Boundary, Beaver Co.	40 40	80 31	1878.6	1 22 W	2 53 W	County surveyors
Easton	40 42	75 15	1841.6	3 38.0 W	7 57 W	A. D. Bache
West Boundary	40 43	80 31	1879.8	1 31 W	2 57 W	Bndy. Com., 1878
Beaver	40 44	80 19	1883.7	1 42 W	2 52 W	County surveyors
West Boundary	40 45	80 31	1879.8	1 39 W	3 05 W	Bndy. Com., 1878
Do.	40 49	80 31	1879.4	1 54 W	3 20 W	Do.
Sunbury	40 52	76 50	1884.5	5 10 W	6 13 W	County surveyors
West Boundary, 79 m. N.	40 52	80 31	1785.7	0 17.5 E	3 54 W	A. Ellicott
Millheim	40 53	77 32	1893	5 40 W	6 10 W	County surveyor
Butler	40 54	79 50	1885.8	2 03 W	3 04 W	B. F. Hilliard
Portland	40 55	75 06	1887.8	7 05 W	7 54 W	G. H. Cook
Lewisburg	40 56	76 52	1901	6 20 W	6 22 W	W. G. Owens
Catawissa	40 57	76 32	1901.0	6 59 W	7 02 W	W. G. Yetter
Curwensville	40 58	78 36	1841.6	1 45.1 W	5 52 W	A. D. Bache
Mahoningtown	40 59	80 26	1894.5	2 34 W	3 01 W	G. B. Zahniser
Water Gap House	40 59	75 08	1887.8	6 36 W	7 25 W	G. H. Cook
Mountain Home	41 00	75 30	1883.8	7 00 W	8 06 W	County surveyors
Newcastle	41 01	80 23	1894.3	1 24 W	1 52 W	G. B. Zahniser
West Boundary, 90 m. N.	41 01	80 31	1785.8	0 19.5 E	3 53 W	A. Ellicott
Morrisdale	41 02	78 08	1870.8	2 42 W	4 47 W	County surveyors
West Boundary	41 07	80 31	1879.5	1 47 W	3 14 W	Bndy. Com., 1878
Brookville	41 10	79 07	1895.0	3 54 W	4 19 W	J. B. Caldwell
Dingman	41 13	74 52	1884.8	6 13 W	7 15 W	G. H. Cook

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

PENNSYLVANIA—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*E or W* ° ′	*E or W* ° ′	
West Boundary	41 13	80 31	1879.5	1 47 W	3 14 W	Bndy. Com., 1878
Clarion	41 14	79 24	1876.5	2 20 W	4 00 W	County surveyors
Mercer	41 14	80 16	1854.0	0 55 W	4 06 W	Do.
Sharpsville	41 17	80 27	1874.6	1 00 W	2 48 W	F. E. Hilgard
West Boundary	41 17	80 31	1878.5	1 42 W	3 13 W	Bndy. Com., 1878
Milford	41 21	74 48	1896	7 55 W	8 12 W	County surveyor
Hyner Run	41 21	77 48	1856.5	3 19 W	6 26 W	S. Tyndale
Ridgway	41 26	78 43	1901.0	5 22 W	5 25 W	A. B. Little
Cameron County	41 27	78 12	1883.9	4 30 W	5 38 W	County surveyors
Johnsonburg	41 29	78 41	1899.0	5 19 W	5 28 W	A. B. Little
Tionesta	41 30	79 31	1895	3 45 W	4 09 W	County surveyor
Honesdale	41 35	75 17	1900.2	8 14 W	8 19 W	L. S. Collins
Meadville	41 39	80 09	1884.8	3 08 W	4 13 W	County surveyors
Towanda	41 45	76 31	1895	7 35 W	7 56 W	County surveyor
Montrose	41 49	75 56	1895	7 58 W	8 19 W	Do.
Warren	41 50	79 12	1896	4 57 W	5 17 W	Do.
Bloomfield	41 50	79 50	1883.8	3 15 W	4 24 W	County surveyors
Niles Valley	41 50	77 21	1893	6 05 W	6 36 W	County surveyor
Silver Lake	41 57	76 02	1841.6	4 30.2 W	8 49 W	A. D. Bache
West B., N. terminal mon.	41 58	80 31	1878.5	2 44 W	4 15 W	Bndy. Com., 1878
Little Meadows, N. Y. line	42 00	76 08	1883.7	7 28 W	8 34 W	H. W. Clarke
N. Y. line, Bradford Co.	42 00	76 30	1877.5	5 32 W	7 05 W	County surveyors
Burt, N. Y. line	42 00	76 44	1882.7	6 04 W	7 14 W	H. W. Clarke
N. Y. line, W. of 90 m. st.	42 00	77 08	1877.7	5 15 W	6 48 W	Do.
N. Y. line, Tioga County	42 00	77 12	1876.5	5 26 W	7 08 W	County surveyor
N.Y. line, n'r m. st. 167 & 168	42 00	78 38	1879.5	4 01.5 W	5 27 W	H. W. Clarke
Monument, N. Y. line	42 00	78 42	1799.5	1 00 W	5 38 W	B. Ellicott
N. Y. M. B. m. st. 18 & Clark	42 00	79 46	1885.1	3 24.5 W	4 29 W	H. W. Clarke
North Springfield	42 00	80 29	1875.8	3 03 W	4 46 W	J. Eisenmann
N. Y. M. B., m. st. 16 & 17	42 02	79 46	1885.6	3 23.3 W	4 25 W	H. W. Clarke
Avonia	42 03	80 18	1875.8	2 02 W	3 45 W	F. M. Towar
N. Y. M. B. m. st. 13, 14, & 15	42 04	79 46	1885.6	3 32.8 W	4 35 W	H. W. Clarke
Fairview	42 05	80 16	1838.5	0.00	4 02 W	H. H. Sherwood
N. Y. M. B. m. st. 10, 11, & 12	42 06	79 46	1885.6	3 28.7 W	4 31 W	H. W. Clarke
N. Y. M. B. m. st. 7, 8, & 9	42 08	79 46	1885.6	3 35.5 W	4 38 W	Do.
N. Y. M. B. m. st. 4, 5, & 6	42 11	79 46	1885.6	3 42.2 W	4 44 W	Do.
N. Y. M. B. m. st. 3	42 13	79 46	1885.6	3 46.2 W	4 48 W	Do.
North East	42 15	79 50	1875.7	2 54 W	4 37 W	J. Eisenmann
N. Y. M. B. st. at Lake Erie	42 16	79 46	1869.7	2 35 W	4 43 W	C. H. F. Peters

PHILIPPINE ISLANDS

Group I	° ′	*East* ° ′		*East* ° ′	*East* ° ′	
Dumaguete, Negros	9 19	123 16	1901.85	1 26.4	1 26	H. C. Mitchell
Maasin, Leyte	10 09	124 49	1901.74	1 20.4	1 21	Do.
Ormoc, Leyte	11 00	124 33	1901.53	1 18.7	1 19	Do.
Tacloban, Leyte	11 14	124 59	1901.64	0 58.4	0 59	Do.
Batangas, Luzon	13 45	121 03	1901.35	0 50.5	0 51	H. W. Rhodes
Balayan, Luzon	13 56	120 44	1901.39	0 53.7	0 54	Do.
Subig, Luzon	14 53	120 14	1901.23	0 59.2	1 00	Do.
Iba, Luzon	15 20	119 57	1901.25	0 47.4	0 48	Do.
Santa Cruz, Luzon	15 46	119 54	1901.29	0 45.5	0 46	Do.

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

PHILIPPINE ISLANDS—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group I—Continued	° ′	*East* ° ′		*East* ° ′	*East* ° ′	
Sual, Luzon	16 04	120 06	1901.08	0 54.2	0 55	F. W. Edmonds
San Fernando del Union, L'n	16 37	120 18	1901.27	0 37.4	0 38	H. C. Mitchell
Candon, Luzon	17 12	120 26	1901.31	0 23.6	0 24	Do.
Vigan, Luzon	17 34	120 23	1901.11	0 20.8	0 21	H. W. Rhodes
Currimao, Luzon	18 01	120 29	1901.24	0 11.6	0 12	H. C. Mitchell
Aparri, Luzon	18 22	121 37	1901.18	0 10.3	0 11	Do.
Group II						
Jolo	6 04	120 59	1888.31	1 10.9	1 18	Martin Juan
Santa Cruz, Mindanao	6 50	125 26	1888.38	1 28.7	1 35	Do.
Zamboanga, Mindanao	6 54	122 03	1888.30	1 57.7	2 05	Do.
Mati, Mindanao	6 56	126 14	1888.41	1 08.3	1 15	Do.
San Jose, Samal	6 57	125 42	1888.39	1 25.9	1 34	Do.
Davao, Mindanao	7 01	125 35	1888.34	1 34.8	1 41	Do.
Caraga, Mindanao	7 15	126 30	1888.44	1 22.7	1 28	Do.
Tagoloan, Mindanao	8 33	124 40	1892.40	1 32.3	1 38	Ricardo Cirera
Dapitan, Mindanao	8 40	123 23	1892.43	1 17.8	1 21	Do.
Tandag, Mindanao	9 02	126 10	1888.48	1 02.8	1 08	Martin Juan
Mambajao	9 16	124 44	1892.39	0 50.0	0 54	Ricardo Cirera
Dumaguete, Negros	9 19	123 16	1892.50	1 24.5	1 27	Do.
Cantilan, Mindanao	9 20	125 59	1888.49	1 10.5	1 16	Martin Juan
Pto. Princesa, Palawan	9 44	118 43	1888.27	1 30.9	1 39	Do.
Surigao, Mindanao	9 48	125 29	1888.50	2 00.4	2 09	Do.
Cebu (Zebu)	10 18	123 54	1892.37	1 19.0	1 24	Ricardo Cirera
Iloilo, Panay	10 42	122 35	1892.50	1 16.3	1 22	Do.
Tacloban, Leyte	11 14	124 59	1892.38	[a] 0 04.8	0 52	Do.
Catbalogan, Samar	11 47	124 52	1892.38	1 06.6	1 12	Do.
Romblon	12 35	122 16	1892.37	0 57.6	1 02	Do.
Tabaco, Luzon	13 22	123 43	1890.47	0 38.9	0 44	T. Jovellanos
Na. Caceres, Luzon	13 37	123 17	1890.54	0 52.2	0 58	Do.
Atimonan, Luzon	14 01	121 54	1890.56	0 49.0	0 55	Do.
Tayabas, Luzon	14 02	121 35	1890.57	0 36.6	0 40	Do.
Daet, Luzon	14 04	122 56	1890.50	0 34.4	0 39	Do.
Manila, Luzon	14 35	120 59	1896.5	0 51.0	0 54	Observatory
San Isidro, Luzon	15 23	120 53	1890.62	0 53.6	0 59	T. Jovellanos
Co. Bolinao, Luzon	16 21	119 45	1890.76	0 52.7	0 59	Do.
Bayombong, Luzon	16 30	121 09	1890.64	0 34.0	0 40	Do.
Vigan, Luzon	17 34	120 22	1890.73	0 30.2	0 37	Do.
Tuguegaras, Luzon	17 35	121 37	1890.69	0 09.6	0 16	Do.
Laoag, Luzon	18 13	120 35	1890.71	0 17.5	0 23	Do.
Aparri, Luzon	18 22	121 35	1890.70	0 05.6	0 12	Do.

PORTO RICO

Group I	° ′	° ′		*E or W* ° ′	*E or W* ° ′	
Point Viento (2)	17 58	65 59	1901.24	1 06 W	1 08 W	J. E. McGrath
Corazon	18 00	66 05	1901.23	0 48 W	0 50 W	Do.
Ponce	18 01	66 36	1901.44	0 50.8 W	0 52 W	W. C. Dibrell
Santa Helena	18 02	65 52	1901.32	0 12 E	0 11 E	J. E. McGrath

[a] This is probably a misprint in "El Magnetismo Terrestre en Filipinos."

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

PORTO RICO—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group I—Continued	° ′	° ′		*E or W* ° ′	*E or W* ° ′	
Aibonita	18 08	66 16	1901.46	1 33.1 W	1 34 W	W. C. Dibrell
Vieques Island	18 08	65 27	1901.38	1 11.0 W	1 12 W	Do.
Lima	18 11	65 42	1901.34	0 53 W	0 54 W	J. E. McGrath
Mesa	18 11	67 06	1901.12	10 33 W	10 35 W	Do.
Culebra	18 19	65 17	1901.43	1 05.8 W	1 07 W	W. C. Dibrell
Atalaya	18 19	67 12	1901.08	0 45 W	0 47 W	J. E. McGrath
La Punta	18 22	67 15	1901.13	1 02 W	1 04 W	Do.
Cruz	18 23	65 43	1902.25	1 37 W	1 36 W	E. E. Torrey
Aguadilla	18 26	67 09	1901.45	1 00 W	1 01 W	O. W. Ferguson
Loiza	18 26	65 53	1902.14	1 32 W	1 32 W	W. C. Dibrell
Baja	18 26	66 24	1901.17	0 45 W	0 47 W	J. Nelson
Club	18 28	66 04	1902.08	1 25 W	1 25 W	W. C. Dibrell
San Juan	18 28	66 08	1901.25	1 02.6 W	1 04 W	Do.
Fraile	18 29	66 16	1901.14	1 22 W	1 24 W	J. Nelson
Amador	18 30	66 51	1901.35	1 13 W	1 14 W	B. E. Tilton
Point Caracoles	18 30	66 40	1901.31	1 25 W	1 26 W	O. W. Ferguson

RHODE ISLAND

Group I	° ′	° ′		*West* ° ′	*West* ° ′	
Watch Hill	41 19	71 51	1847.72	7 33.4	10 36	R. H. Fauntleroy
Point Judith	41 22	71 29	1847.68	8 59.7	12 02	Do.
Boston Neck	41 27	71 26	1899.60	11 38.4	11 42	D. L. Hazard
McSparran	41 30	71 27	1899.65	11 51.6	11 55	Do.
Newport	41 30	71 20	1896.47	11 27.9	11 39	G. R. Putnam
Spencer	41 41	71 30	1844.62	9 05.9	12 22	T. J. Lee
Providence	41 50	71 24	1895.63	11 35.2	11 48	J. B. Baylor
Beaconpole	42 00	71 27	1844.86	9 27.0	12 41	T. J. Lee
Group II						
Sakonnet River	41 27	71 12	1775.5	6 00	11 42	
Newport	41 28	71 20	1832.5	8 12	12 16	A. S. Wadsworth

SOUTH CAROLINA

Group I	° ′	° ′		*E or W* ° ′	*E or W* ° ′	
Graham, Hilton Head I.	32 13	80 46	1870.20	1 55.5 E	0 02 E	C. O. Boutelle
Port Royal	32 18	80 38	1859.09	3 04.1 E	0 30 E	Do.
Woods	32 23	80 41	1902.27	0 26.5 E	0 27 E	O. B. French
Beaufort	32 26	80 40	1875.37	1 58.3 E	0 25 E	C. O. Boutelle
Bay Point	32 30	80 21	1902.25	1 38.3 W	1 38 W	O. B. French
Edisto Island, East Base	32 33	80 14	1850.26	2 53.6 E	0 11 W	G. Davidson
Sullivan I., Breach Inlet	32 46	79 49	1902.35	0 32.9 W	0 32 W	O. B. French
Live Oak	33 03	79 31	1902.34	0 30.6 W	0 30 W	Do.
Allston	33 22	79 17	1853.98	2 06.5 E	0 45 W	C. O. Boutelle
Aiken	33 32	81 43	1885.97	1 27.4 E	0 33 E	J. B. Baylor
Columbia	34 00	81 02	1900.22	0 12.6 E	0 07 E	D. L. Hazard

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

SOUTH CAROLINA—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group I—Continued	° ′	° ′		*E or W* ° ′	*E or W* ° ′	
Florence	34 09	79 43	1891.34	0 00.9 W	0 36 W	J. B. Baylor
Marion	34 09	79 24	1891.35	0 22.2 W	0 57 W	Do.
Green	34 49	82 14	1896.94	0 15.9 E	0 00	W. C. Hodgkins
Baker	34 51	82 13	1896.94	0 09.6 E	0 06 W	Do.
Pelham	34 52	82 13	1896.90	0 17.7 E	0 02 E	Do.
Greers	34 57	82 13	1896.90	0 06.5 E	0 10 W	Do.
Spartanburg	34 58	81 56	1896.90	0 04.3 E	0 12 W	Do.
Flint Rock	34 59	82 13	1896.91	0 03.2 E	0 13 W	Do.
Gold Mine	35 02	82 13	1896.92	0 25.8 E	0 10 E	Do.
Gowensville	35 07	82 13	1896.89	0 33.4 E	0 17 E	Do.
Talent	35 09	82 13	1896.93	0 05.4 E	0 11 W	Do.
Block House	35 12	82 13	1896.88	0 16.8 E	0 01 E	Do.
Group II						
Beaufort	32 26	80 40	1901.3	0 30 E	0 28 E	George Gage
Robertsville	32 36	81 12	1843.5	3 25 E	0 01 E	W. T. Feay
Yemassee	32 40	80 48	1901.3	0 01 E	0 01 W	E. W. Screven
McPhersonville	32 45	80 50	1901.3	0 01 E	0 01 W	Do.
Charleston, 5 miles NW.	32 50	80 00	1901.3	0 39 W	0 41 W	Do.
Blackville	33 25	81 15	1901.3	0 14 E	0 12 E	Do.
North Augusta	33 30	81 58	1901.3	0 42 E	0 40 E	Do.
Edgefield	33 50	81 55	1901.3	0 18 E	0 16 E	Do.
Florence	34 09	79 43	1894.6	0 14 W	0 38 W	J. W. Brunson
Lang Place, Kershaw Co.	34 20	80 40	1901.4	0 19 W	0 21 W	E. W. Screven
Marlboro County	.. ..	.. ..	1895	2 30 W	2 51 W	County surveyor
Clemson College	34 40	82 50	1901	0 00	0 02 W	Students
Chester	34 41	81 14	1894	0 30 W	0 54 W	County surveyor
Union	34 43	81 36	1901.5	0 20 E	0 18 E	E. W. Screven
Pacolet	34 51	81 45	1886.4	1 15 E	0 23 E	G. E. Ladshaw

SOUTH DAKOTA

Group I	° ′	° ′		*East* ° ′	*East* ° ′	
Yankton	42 53	97 25	1896.38	11 10.7	10 49	R. L. Faris
Sioux Falls	43 33	96 44	1900.66	11 24.8	11 19	J. W. Miller
Mitchell	43 42	98 01	1896.39	11 40.3	11 19	R. L. Faris
Huron	44 21	98 14	1900.67	11 08.2	11 03	J. W. Miller
Pierre	44 22	100 22	1896.40	12 44.4	12 24	R. L. Faris
Redfield	44 53	98 31	1900.67	12 58.0	12 53	J. W. Miller
Watertown	44 55	97 06	1900.68	10 02.3	9 57	Do.
Gettysburg	45 02	99 58	1900.68	12 59.8	12 55	Do.
Aberdeen	45 28	98 29	1896.41	12 17.8	11 56	R. L. Faris
Group II						
Union County	.. ..	.. ..	1864	12 04	10 00	Mean, 8 stations
Clay County	.. ..	.. ..	1862	12 44	10 36	Mean, 11 stations
Yankton	42 53	97 25	1896	11 26	11 05	County surveyor
Yankton County	.. ..	.. ..	1864	12 16	10 22	Mean, 8 stations
Bonhomme County	.. ..	.. ..	1868	13 23	11 30	Mean, 3 stations
Shannon County	.. ..	.. ..	1889	15 13	14 32	Mean, 5 stations

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

SOUTH DAKOTA—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Lugenbeel County	.. ..	.. ..	1893	13 55	13 27	Mean, 7 stations
Gregory County	.. ..	.. ..	1892	12 55	12 19	Mean, 10 stations
Tripp County	.. ..	.. ..	1893	13 00	12 30	Do.
Lincoln County	.. ..	.. ..	1863	12 50	10 44	Mean, 14 stations
Turner County	.. ..	.. ..	1867	12 34	10 40	Mean, 18 stations
Fall River County	.. ..	.. ..	1887	15 19	14 35	Mean, 35 stations
South Cheyenne River	43 18	103 50	1877.8	15 30.3	14 25	W. S. Stanton
Charles Mix County	.. ..	.. ..	1872	13 47	12 08	Mean, 17 stations
Meyer County	.. ..	.. ..	1892	13 06	12 32	Mean, 6 stations
Hutchinson County	.. ..	.. ..	1866	12 30	10 38	Mean, 9 stations
Douglas County	.. ..	.. ..	1869	14 33	12 46	Mean, 3 stations
Washabaugh County	.. ..	.. ..	1892	14 14	13 42	1 station
Washington County	.. ..	.. ..	1890	14 44	14 06	Mean, 10 stations
Sioux Falls	43 33	96 40	1900.8	10 10	10 05	S. B. Howe
Minnehaha County	.. ..	.. ..	1865	12 06	10 05	Mean, 23 stations
McCook County	.. ..	.. ..	1870	12 25	10 35	Mean, 16 stations
Hanson County	.. ..	.. ..	1870	12 56	11 10	Mean, 6 stations
Davison County	.. ..	.. ..	1872	13 31	11 52	Mean, 2 stations
Custer County	.. ..	.. ..	1883	15 21	14 27	Mean, 16 stations
Custer	43 45	103 34	1896	15 30	15 12	County surveyor
White River	43 45	99 45	1860.5	14 50	13 00	W. F. Raynolds
French Creek	43 46	103 34	1877.8	15 21.5	14 15	W. S. Stanton
Lyman County	.. ..	.. ..	1889	13 18	12 33	Mean, 24 stations
Aurora County	.. ..	.. ..	1873	14 14	12 37	Mean, 5 stations
Brule County	.. ..	.. ..	1881	14 05	12 52	Mean, 12 stations
Chamberlain	43 48	99 20	1896	12 43	12 23	County surveyor
Presho County	.. ..	.. ..	1886	13 25	12 32	Mean, 30 stations
Jackson County	.. ..	.. ..	1890	14 00	13 20	Mean, 14 stations
Pratt County	.. ..	.. ..	1890	13 47	13 06	Mean, 30 stations
Hill	43 56	103 33	1895	15 15	14 55	County surveyor
Spring Creek	43 57	103 12	1877.8	16 21.5	15 12	W. S. Stanton
Pennington County	.. ..	.. ..	1883	15 19	14 23	Mean, 25 stations
Moody County	.. ..	.. ..	1867	12 37	10 40	Mean, 20 stations
Lake County	.. ..	.. ..	1872	12 18	10 35	Mean, 11 stations
Miner County	.. ..	.. ..	1877	12 37	11 10	Do.
Sanborn County	.. ..	.. ..	1873	13 43	12 05	Mean, 3 stations
Ziebach County	.. ..	.. ..	1890	14 51	14 13	Mean, 18 stations
Buffalo County	.. ..	.. ..	1872	13 41	12 03	Mean, 10 stations
Jerauld County	.. ..	.. ..	1875	13 24	11 53	Do.
Wessington	44 06	98 32	1895	12 45	12 20	County surveyor
Cold Springs	44 09	104 02	1877.6	15 41.3	14 40	W. S. Stanton
Nowlin County	.. ..	.. ..	1890	14 10	13 32	Mean, 32 stations
Meade County	.. ..	.. ..	1884	15 38	13 48	Do.
Brookings	44 18	96 45	1901.2	10 55	10 52	A. B. Crane
Brookings County	.. ..	.. ..	1871	12 34	10 45	Mean, 20 stations
Kingsbury County	.. ..	.. ..	1874	12 44	11 06	Mean, 15 stations
Beadle County	.. ..	.. ..	1877	13 14	11 35	Mean, 19 stations
Hughes County	.. ..	.. ..	1882	14 44	13 38	Mean, 27 stations
Stanley County	.. ..	.. ..	1890	13 12	12 31	Mean, 40 stations
Fort Pierre	44 25	100 24	1860.0	14 45	12 55	W. F. Raynolds
Lawrence County	.. ..	.. ..	1881	16 10	15 12	Mean, 5 stations
Oak Grove	44 27	103 36	1877.8	16 03.7	15 00	W. S. Stanton
Spearfish	44 30	103 50	1885	16 00	15 13	County surveyor
Hyde County	.. ..	.. ..	1881	13 28	12 19	Mean, 22 stations
Hand County	.. ..	.. ..	1882	13 28	12 20	Mean, 40 stations

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

SOUTH DAKOTA—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Contiuued	° ′	° ′		*East* ° ′	*East* ° ′	
Sterling County	.. ..	.. ..	1890	14 39	14 00	Mean, 26 stations
Scobey County	.. ..	.. ..	1890	15 11	14 33	Mean, 28 stations
Cheyenne River	44 35	101 25	1859.5	14 30	12 55	W. F. Raynolds
Red Earth Creek	44 35	103 54	1859.5	17 00	15 40	Do.
Belle Fourche	44 40	103 50	1901.0	15 15	15 12	H. E. Thompson
Hamlin County	.. ..	.. ..	1874	12 31	10 55	Mean, 8 stations
Camp on St. Peters River	44 41	97 00	1823.5	12 21	.. ..	S. H. Long
Deuel County	.. ..	.. ..	1877	12 34	11 03	Mean, 23 stations
Sully County	.. ..	.. ..	1882	14 37	13 31	Mean, 33 stations
Pratt County	.. ..	.. ..	1890	14 23	13 43	Mean, 6 stations
Delano County	.. ..	.. ..	1891	15 08	14 30	Mean, 10 stations
Clark County	.. ..	.. ..	1876	13 26	11 58	Mean, 11 stations
Butte County	.. ..	.. ..	1891	15 44	15 12	Mean, 73 stations
Spink County	.. ..	.. ..	1878	13 41	12 18	Mean, 17 stations
Codington County	.. ..	.. ..	1874	13 10	11 32	Mean, 11 stations
Faulk County	.. ..	.. ..	1883	13 45	12 40	Mean, 28 stations
Potter County	.. ..	.. ..	1883	13 55	12 50	Mean, 27 stations
Grant County	.. ..	.. ..	1875	12 25	10 48	Mean, 22 stations
Choteau County	.. ..	.. ..	1892	15 24	14 52	Mean, 20 stations
Rinehart County	.. ..	.. ..	1892	15 25	14 53	Mean, 16 stations
Little Moreau River	45 18	101 02	1860.5	16 30	14 55	W. F. Raynolds
Day County	.. ..	.. ..	1879	13 29	12 08	Mean, 21 stations
Walworth County	.. ..	.. ..	1883	14 05	13 00	Mean, 27 stations
Edmunds County	.. ..	.. ..	1883	13 56	12 50	Mean, 32 stations
Harding County	.. ..	.. ..	1891	15 54	15 24	Mean, 21 stations
Brown County	.. ..	.. ..	1881	14 08	12 54	Mean, 35 stations
Roberts County	.. ..	.. ..	1876	12 53	11 20	Mean, 24 stations
Columbia Fur Co., fort	45 39	96 34	1823.5	12 29	.. ..	S. H. Long
Marshall County	.. ..	.. ..	1881	12 38	11 24	Mean, 30 stations
McPherson County	.. ..	.. ..	1884	14 22	13 20	Mean, 32 stations
Campbell County	.. ..	.. ..	1884	14 35	13 35	Mean, 25 stations
Wagner County	.. ..	.. ..	1892	15 45	15 13	Mean, 9 stations
Martin County	.. ..	.. ..	1893	15 44	15 16	Mean, 19 stations
Ewing County	.. ..	.. ..	1893	15 47	15 22	Mean, 4 stations

TENNESSEE

Group I	° ′	° ′		*E or W* ° ′	*E or W* ° ′	
Chattanooga	35 01	85 18	1900.44	1 26.3 E	1 21 E	D. L. Hazard
Grand Junction	35 05	89 13	1881.69	5 58.9 E	4 45 E	J. B. Baylor
Memphis	35 08	90 04	1901.15	5 26.7 E	5 24 E	W. Weinrich
Pulaski	35 13	87 03	1881.65	5 01.5 E	3 47 E	J. B. Baylor
Tullahoma	35 22	86 13	1881.59	3 30.9 E	2 17 E	Do.
Clifton	35 23	88 01	1865.18	5 48 E	3 40 E	A. T. Mosman
Athens	35 27	84 37	1881.55	1 44.2 E	0 30 E	J. B. Baylor
Columbia	35 37	87 04	1881.63	4 35.5 E	3 21 E	Do.
Jackson	35 39	88 51	1881.71	5 49.8 E	4 36 E	Do.
Murfreesboro	35 53	86 25	1881.61	4 53.5 E	3 40 E	Do.
Knoxville	35 57	83 56	1900.45	0 00.2 W	0 06 W	D. L. Hazard
Johnsonville	36 04	88 00	1865.19	5 50 E	3 42 E	A. T. Mosman
Big Butt	36 04	82 38	1893.8	0 39.0 E	0 12 E	A. H. Buchanan

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

TENNESSEE—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group I—Continued	° ′	° ′		*E or W* ° ′	*E or W* ° ′	
Rutherford	36 09	89 01	1881.72	5 59.6 E	4 46 E	J. B. Baylor
Nashville	36 09	86 48	1888.60	4 31.0 E	3 43 E	Do.
Lebanon, North Base	36 13	86 18	1898.23	3 56.5 E	3 43 E	A. H. Buchanan
Careyville	36 18	84 13	1900.46	0 11.2 E	0 06 E	D. L. Hazard
Fort Henry	36 30	88 04	1865.19	6 24 E	4 16 E	A. T. Mosman
Group II						
Polk County, Ga., Line	35 00	.. ..	1901.2	2 00 E	1 57 E	J. L. Williams
Lincoln County	.. ..	.. ..	1895	3 56 E	3 33 E	County surveyor
Bradley County	.. ..	.. ..	1895	2 35 E	2 12 E	Do.
Cleveland	35 10	84 52	1875.5	3 30.6 E	1 54 E	F. E. Hilgard
Sewanee	35 12	85 54	1900.7	2 55 E	2 50 E	S. M. Barton
Mouth of Okoee River	35 13	84 39	1899.8	1 41 E	1 33 E	G. W. Metcalfe
Long Savannah	35 14	84 59	1895	2 00 E	1 37 E	County surveyor
Candy Creek, mouth	35 20	84 50	1899.9	1 10 E	1 03 E	G. W. Metcalfe
Montezuma	35 22	88 42	1895	3 45 E	3 22 E	County surveyor
Coffee County	.. ..	.. ..	1901	2 32 E	2 29 E	Logan Darnell
Lewis County	.. ..	.. ..	1895	3 48 E	3 25 E	County surveyor
Madisonville	35 31	84 21	1895	0 15 E	0 08 W	Do.
Haywood County	.. ..	.. ..	1895	4 55 E	4 32 E	Do.
Brownsville	35 34	89 16	1901.2	4 15 E	4 12 E	J. D. Anthony
Ninemile Creek, Lit. Tenn. R.	35 36	84 12	1899.8	0 45 E	0 37 E	G. W. Metcalfe
Perrysville	35 38	88 03	1895	4 24 E	4 01 E	County surveyor
Coytee Landing	35 43	84 15	1899.8	0 15 E	0 07 E	G. W. Metcalfe
Loudon	35 45	84 20	1900	0 00 E	0 05 W	J. C. M. Bogle
Cope	35 48	85 45	1900?	1 50 E	1 45 E	C. C. Benefield
Sevierville	35 52	83 32	1899.6	0 30 E	0 22 E	H. S. Bosler
Clinch R., White Oak Crk.	.. ..	.. ..	1899.5	2 04 E	1 55 E	Do.
Clinch River, Knox-Roane county line	35 54	84 16	1899.5	1 30 E	1 21 E	Do.
Pigeon River, mouth	35 56	83 35	1899.6	0 25 E	0 17 E	Do.
Newport	35 57	83 13	1901.2	0 00	0 03 W	C. B. McNabb
Caswell Station	35 57	83 50	1901.2	0 15 E	0 12 E	R. A. J. Armstrong
Knox County	.. ..	.. ..	1895	0 45 E	0 22 E	County surveyor
Holston River, mouth	35 58	83 51	1899.6	0 16 E	0 08 E	H. S. Bosler
Catletts Ferry	35 58	83 31	1899.6	0 23 E	0 15 E	Do.
Clinch River, Knox-Anderson county line	35 59	84 10	1899.5	0 00	0 09 W	Do.
Dandridge Ferry	36 01	83 25	1899.6	0 14 E	0 06 E	Do.
Sehorn Creek, mouth	36 02	83 20	1899.6	0 26 E	0 18 E	Do.
French Br'd R., So. Ry. brdg.	36 05	83 15	1899.5	0 20 E	0 11 E	Do.
Clinch R., So. Ry. bridge	36 08	84 08	1899.5	0 24 E	0 15 E	Do.
Newmarket	36 09	83 36	1900.1	0 45 E	0 38 E	G. W. Metcalfe
Hinds Creek, mouth	36 12	84 09	1899.5	0 35 E	0 26 E	H. S. Bosler
Gleason	36 12	88 38	1895	4 20 E	3 57 E	County surveyor
Edgefield	36 15	86 46	1871.9	5 02 E	3 14 E	T. C. Hilgard
Cane Creek, mouth	36 15	84 06	1899.5	0 40 E	0 31 E	H. S. Bosler
Lake County	.. ..	.. ..	1901.2	3 45 E	3 42 E	Walter Smith
Reelfoot	36 17	89 28	1895	3 30 E	3 07 E	County surveyor
Powell River, mouth	36 18	84 01	1899.5	1 56 E	1 47 E	H. S. Bosler
Hitches Ferry, Clinch R.	.. ..	.. ..	1899.5	1 04 E	0 55 E	Do.
Dodson Creek, mouth	36 20	83 45	1899.4	0 30 E	0 21 E	Do.
Clinch River, 1½ miles below Black Fox Creek	36 22	83 41	1899.4	0 00	0 09 W	Do.

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

TENNESSEE—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*E or W* ° ′	*E or W* ° ′	
Clinch R., So. Ry. bridge	36 22	83 33	1899.4	0 34 W	0 43 W	H. S. Bosler
Galbreath Spring	36 22	83 10	1900.0	0 27 E	0 20 E	G. W. Metcalfe
Jackson County	.. ..	.. ..	1859	5 37 E	3 07 E	Boundary survey
Overton County	.. ..	.. ..	....	. ..	2 48 E	Mean, 3 stations
Livingston	36 23	85 20	1892	3 30 E	2 57 E	County surveyor
Pleasant Shade	36 23	85 58	1896	5 08 E	4 49 E	Do.
Rogersville	36 25	83 03	1873.6	1 49.0 E	0 05 E	F. E. Hilgard
Cressy Creek, mouth	36 28	82 46	1899.9	0 19 W	0 26 W	G. W. Metcalfe
Bluff City	36 28	82 16	1895	0 15 E	0 08 W	County surveyor
Sumner County	.. ..	.. ..	1895	4 00 E	3 37 E	Do.
Obion County	.. ..	.. ..	1859	6 17 E	3 52 E	Boundary survey
Near Cumberland Gap	36 30	83 55	1890.6	0 05.7 W	0 46 W	O. A. Landreth
Henry County	.. ..	.. ..	....	. ..	5 08 E	Boundary survey
Claiborne County	.. ..	.. ..	1859	4 10 E	1 35 E	Do.
Macon County	.. ..	.. ..	1859	6 24 E	3 54 E	Do.
Robertson County	.. ..	.. ..	1859	7 20 E	4 50 E	Do.
Stewart County	.. ..	.. ..	1859	6 48 E	4 18 E	Do.

TEXAS

Group I	° ′	° ′		*East* ° ′	*East* ° ′	
Mouth of Rio Grande	25 57	97 09	1853.85	9 00.9	7 12	W. H. Emory
Peña	27 19	98 39	1890.08	8 30.7	7 52	J. B. Baylor
Laredo, Fort McIntosh	27 30	99 31	1895.33	8 34.6	8 14	E. Smith
Laredo	27 32	99 31	1890.10	8 47.7	8 12	J. B. Baylor
San Diego	27 46	98 11	1890.08	8 24.1	7 45	Do.
Corpus Christi	27 48	97 23	1890.05	8 25.2	7 46	Do.
Beeville	28 23	97 41	1890.06	8 57.0	8 18	Do.
Cotulla	28 27	99 14	1901.98	8 42.4	8 42	E. D. Preston
Carrizo Springs	28 30	99 51	1902.00	9 44.6	9 45	Do.
Port Lavaca	28 37	96 37	1890.16	8 04.5	7 25	J. B. Baylor
Eagle Pass	28 44	100 30	1901.99	9 19.5	9 19	E. D. Preston
Victoria	28 48	97 00	1901.72	8 49.2	8 49	J. M. Kuehne
Karnes City	28 53	97 54	1901.74	8 28.0	8 27	Do.
Pearsall	28 55	99 09	1901.97	8 17.2	8 17	E. D. Preston
Jupiter	28 55	95 21	1853.36	9 08.7	7 20	G. W. Dean
Edna	28 58	96 40	1901.72	8 12.6	8 12	J. M. Kuehne
Cuero	29 06	97 17	1901.69	8 14.8	8 14	Do.
Lindenau	29 08	97 22	1901.72	8 13.0	8 12	Do.
Columbia	29 10	95 35	1890.27	7 37.3	6 59	J. B. Baylor
Spofford	29 11	100 25	1890.14	9 13.9	8 38	Do.
Uvalde	29 13	99 48	1901.85	9 38.6	9 39	E. D. Preston
Galveston I., East Base	29 13	94 56	1853.21	9 05.0	7 16	G. W. Dean
Galveston	29 18	94 47	1895.44	7 19.3	6 58	E. Smith
Wharton	29 18	96 04	1890.19	8 19.6	7 41	J. B. Baylor
Hondo	29 19	99 05	1901.83	8 33.4	8 33	E. D. Preston
Brackettville	29 19	100 25	1901.87	9 09.5	9 09	Do.
Del Rio, S. M.	29 22	100 52	1901.89	9 48.3	9 48	Do.
Del Rio, N. M.	.. ..	.. ..	1901.89	9 24.3	9 24	Do.
Dollar Point	29 26	94 53	1878.41	8 17.3	7 07	J. B. Baylor
Hallettsville	29 27	96 57	1901.71	8 26.9	8 26	J. M. Kuehne

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

TEXAS—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group I—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
San Antonio, mag. obsy.	29 27	98 28	1892.33	8 48.5	8 17	Halter & Schultz
Hillside Ranch, mag. obsy.	29 29	98 32	1895.07	8 43.9	8 21	Do.
Gonzales	29 30	97 26	1901.70	8 11.4	8 11	J. M. Kuehne
Houston	29 42	95 20	1890.25	7 56.5	7 18	J. B. Baylor
Bandera	29 44	99 05	1901.47	8 34.9	8 33	F. M. Little
Langtry	29 48	101 35	1890.14	9 33.3	8 57	J. B. Baylor
La Grange	29 53	96 53	1890.23	8 04.7	7 26	J. B. Baylor
Kerrville	30 01	99 08	1901.47	8 28.8	8 27	F. M. Little
Rock Springs	30 01	100 12	1901.49	9 30.4	9 29	Do.
Orange	30 03	93 43	1890.29	7 09.8	6 32	J. B. Baylor
Liberty	30 04	94 50	1890.28	7 48.9	7 11	Do.
Beaumont	30 05	94 05	1890.29	7 30.7	6 53	Do.
Hempstead	30 08	96 10	1878.48	8 36.7	7 27	Do.
Sanderson	30 09	102 26	1890.12	10 08.4	9 36	Do.
Marathon	30 14	103 16	1902.02	9 21.6	9 22	E. D. Preston
Fredericksburg	30 15	98 53	1901.47	8 59.2	8 58	F. M. Little
Austin	30 15	97 45	1901.36	8 06.8	8 05	Wallis & Little
Marfa	30 19	104 01	1902.04	10 44.0	10 44	E. D. Preston
Alpine	30 22	103 40	1902.00	10 09.5	10 10	Do.
Junction City	30 29	99 53	1901.51	9 06.8	9 05	F. M. Little
Sonora	30 35	100 40	1901.54	9 22.4	9 21	Do.
Valentine	30 35	104 30	1902.06	11 06.0	11 06	E. D. Preston
Ozona	30 43	101 13	1901.54	9 35.6	9 34	F. M. Little
Llano	30 44	98 41	1901.45	9 15.0	9 13	Do.
Mason	30 45	99 14	1901.46	9 48.7	9 47	Do.
Eldorado	30 52	100 39	1901.53	9 10.9	9 09	Do.
Menardville	30 54	99 51	1901.52	8 31.0	8 30	Do.
Lampasas	31 01	98 11	1901.35	8 24.1	8 22	Wallis & Little
Kent	31 04	104 14	1902.06	11 10.0	11 10	E. D. Preston
Belton	31 04	97 28	1901.34	8 25.2	8 23	Wallis & Little
Brady	31 08	99 21	1901.44	9 33.0	9 31	F. M. Little
Sierra Blanca	31 10	105 18	1888.93	11 17.7	10 44	J. B. Baylor
San Saba	31 11	98 43	1901.45	8 57.6	8 56	F. M. Little
Sherwood	31 17	100 48	1901.55	9 36.5	9 35	Do.
Pecos, S. M.	31 26	103 33	1901.90	10 20.2	10 20	E. D. Preston
Pecos, N. M.	.. ..	.. ..	1901.90	10 29.3	10 29	Do.
San Angelo	31 28	100 26	1901.56	9 25.9	9 25	F. M. Little
San Angelo, N. M.	.. ..	.. ..	1901.60	9 30.3	9 29	Do.
Paint Rock	31 30	99 55	1901.41	9 49.2	9 47	Do.
Groesbeck	31 32	96 31	1901.33	8 27.1	8 25	Wallis & Little
Ballinger	31 45	99 58	1901.40	9 53.2	9 51	F. M. Little
El Paso	31 46	106 29	1895.29	11 46.0	11 28	E. Smith
Boundary	31 47	106 31	1892.33	11 53.3	11 28	O. B. French
Guadalupe	31 49	103 55	1902.07	10 57.2	10 57	E. D. Preston
Coleman	31 50	99 25	1901.43	9 20.8	9 19	Wallis & Little
Sterling City	31 51	101 00	1901.61	10 24.8	10 24	F. M. Little
Garden City	31 52	101 29	1901.62	10 34.7	10 34	Do.
Robert Lee	31 54	100 29	1901.61	9 58.2	9 57	Do.
Stephenville	32 13	98 12	1901.31	8 47.6	8 46	Wallis & Little
Big Springs	32 15	101 28	1901.62	10 14.8	10 14	F. M. Little
Colorado, station of 1900	32 23	100 52	1901.64	10 49.2	10 48	Do.
Colorado, S. M.	.. ..	.. ..	1901.64	10 47.6	10 46	Do.
Cisco	32 23	98 56	1888.95	9 38.1	9 00	J. B. Baylor
Kaufman	32 35	96 19	1901.32	7 59.5	7 57	Wallis & Little
Mineola	32 40	95.26	1888.97	8 07.3	7 25	J. B. Baylor

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

TEXAS—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group I—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Snyder	32 43	100 56	1901.65	10 25.7	10 25	F. M. Little
Albany	32 43	99 18	1901.66	9 26.0	9 25	Do.
Roby	32 45	100 22	1901.65	10 15.7	10 15	Do.
Anson	32 45	99 54	1901.66	10 15.0	10 14	Do.
Anson, S. M.	.. ..	.. ..	1901.66	9 50.8	9 50	Do.
Fort Worth	32 45	97 20	1888.96	9 07.2	8 25	J. B. Baylor
Breckenridge	32 46	98 53	1901.67	9 33.1	9 32	F. M. Little
Palo Pinto	32 46	98 17	1901.68	8 59.8	8 59	Do.
Mineral Wells	32 48	98 06	1901.69	9 01.1	9 00	Do.
Graham	33 04	98 35	1901.70	9 10.0	9 09	Do.
Aspermont	33 07	100 13	1901.72	10 50.0	10 49	Do.
Haskell	33 10	99 43	1901.71	9 46.8	9 46	Do.
Clairemont	33 10	100 45	1901.72	10 11.2	10 10	Do.
Throckmorton	33 11	99 10	1901.71	9 35.1	9 34	Do.
Jacksboro	33 13	98 09	1901.69	9 08.3	9 07	Do.
Texarkana	33 26	94 03	1901.34	7 18.8	7 17	W. Weinrich
Benjamin	33 34	99 48	1901.74	9 54.0	9 53	F. M. Little
Sherman	33 36	96 36	1878.52	9 19.9	8 10	J. B. Baylor
Seymour	33 36	99 16	1901.75	9 46.4	9 46	F. M. Little
Dickens	33 37	100 50	1901.73	10 04.6	10 04	Do.
Guthrie	33 37	100 19	1901.74	10 45.6	10 45	Do.
Gainesville	33 37	97 09	1900.04	9 06.3	8 59	J. A. Fleming
Henrietta	33 49	98 12	1900.03	9 07.5	9 01	Do.
Vernon	34 09	99 18	1900.94	9 40.9	9 37	W. C. Dibrell
Memphis	34 45	100 32	1900.01	9 49.4	9 42	J. A. Fleming
Amarillo	35 14	101 51	1900.00	11 31.6	11 25	Do.
Group II						
Ringgold Barracks	26 23	98 43	1853.5	9 15	7 26	W. H. Emory
San Patricio	27 57	97 46	1873	9 05	7 44	County surveyor
Rockport	28 01	97 04	1895	7 47	7 26	Do.
Refugio	28 18	97 15	1887	8 45	7 59	Do.
Pass Carallo	28 21	96 24	1879.6	8 20	7 12	U. S. engineers
Matagorda	28 41	95 58	1877.5	8 25	7 13	A. H. Bishop
Goliad	28 41	97 24	1895	8 15	7 54	County surveyor
Wilson County, S. corner	28 53	98 14	1901.2	8 47	8 44	W. T. Sutherland
Batesville	28 56	99 34	1893	8 50	8 24	County surveyor
Pleasanton	28 59	98 30	1893	8 55	8 28	Do.
Floresville	29 08	98 13	1886.6	8 56	8 08	W. T. Sutherland
Wied	29 25	97 07	1900.6	8 10.1	8 05	J. M. Kuehne
San Antonio	29 27	98 28	1895	9 45	9 24	County surveyor
Colorado County	.. ..	.. ..	1894	9 23	8 58	Do.
Bandera County	.. ..	.. ..	1894	8 55	8 30	Do.
Houston	29 42	95 20	1895	7 08	6 47	Do.
Sabine River, mouth	29 44	93 52	1840.1	8 40.2	6 49	J. D. Graham
Sealy	29 47	96 09	1895	8 50	8 29	County surveyor
Comal County	.. ..	.. ..	1895	7 47	7 26	Do.
Boerne	29 49	98 39	1892.4	8 56	8 26	R. K. Croskey
Wallisville	29 49	94 45	1895	7 08	6 47	County surveyor
Eminence	29 49	94 42	1901.2	7 35	7 32	G. H. Giddings
Bellville	29 57	96 16	1898.3	8 15	8 03	J. H. Machemehl
Dryden	29 57	102 07	1896	10 30	10 15	County surveyor
Brenham	30 10	96 24	1893	8 28	8 00	Do.
Johnson	30 16	98 22	1896	9 15	8 58	Do.
Willis	30 27	95 30	1838.5	9 31	7 41	L. Burnes

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

TEXAS—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued.	° ′	° ′		*East* ° ′	*East* ° ′	
Georgetown	30 38	97 40	1893	8 26	7 58	County surveyor
Brazos	30 42	96 20	1823.5	10 37	. ..	
Burnet	30 44	98 13	1873.9	9 46	8 26	J. W. Glenn
Polk County	.. ..	.. ..	1895	8 15	7 54	County surveyor
Cameron	30 50	96 59	1893	8 30	8 02	Do.
Newton	30 51	93 43	1895	7 45	7 24	Do.
Menard County	.. ..	.. ..	1901.2	8 30	8 27	D. W. Maddox
Jasper	30 56	93 56	1895	7 29	7 08	County surveyor
Franklin	31 01	96 30	1895	8 50	8 29	Do.
Mouth of Canyon	31 02	105 37	1852.5	12 01	10 46	W. H. Emory
Goldthwaite	31 28	98 34	1895	9 30	9 10	County surveyor
Nacogdoches	31 36	94 37	1895	8 00	7 39	Do.
Coleman County	.. ..	.. ..	1895	8 50	8 30	Do.
Cherokee	31 45	95 00	1835.5	9 20	7 33	
Center	31 46	94 08	1895	7 20	6 59	Do.
Rusk	31 48	95 08	1892	8 00	7 29	Do.
Frontera	31 49	106 33	1859.1	12 25.0	11 11	J. H. Clark
Odessa	31 49	102 18	1891	10 50	10 22	County surveyor
Midland	31 57	102 02	1887	11 20	10 43	Do.
25 miles south of Abilene	32 02	99 40	1901.2	9 37	9 34	W. A. Riney
Panola County	.. ..	.. ..	1895	8 00	7 39	County surveyor
Henderson	32 09	94 45	1901.1	7 45	7 42	R. H. Thompson
20 miles S. of W. of Abilene	32 12	99 49	1901.2	9 37	9 35	W. A. Riney
Erath County	.. ..	.. ..	1888	9 30	8 50	County surveyor
Somervell County	.. ..	.. ..	1895	9 15	8 55	Do.
Eastland	32 21	98 45	1889	9 40	9 03	Do.
5 miles east of Abilene	32 22	99 34	1901.2	9 45	9 42	W. A. Riney
Granbury	32 26	97 48	1892	8 45	8 18	County surveyor
Gregg County	.. ..	.. ..	1901.2	7 40	7 37	J. H. Simmons
Longview	32 29	94 41	1872.3	8 37.8	7 15	T. C. Hilgard
Canton	32 30	95 50	1894	7 22	6 57	County surveyor
Gail	32 42	101 27	1894	9 00	8 37	Do.
Fort Worth	32 45	97 20	1891	8 56	8 22	Do.
Rockwall	32 54	96 29	1895	7 45	7 24	Do.
Brazos River, Fork	33 00	99 17	1854.5	11 12	9 40	
Young County	.. ..	.. ..	1894	9 50	9 27	Do.
Rayner	33 06	99 59	1895	9 45	9 25	Do.
Douglassville	33 08	94 20	1896	7 00	6 40	Do.
Sulphur Springs	33 08	95 32	1888.4	8 48	8 05	E. A. Wells
Franklin County	.. ..	.. ..	1901.2	7 30	7 27	G. E. Cowan
McKinney	33 11	96 35	1894	9 24	9 00	County surveyor
Trinity River, West Fork	33 29	98 52	1854.5	10 17	8 45	J. Pope
Trinity Waters	33 34	98 15	1854.5	10 27	8 55	Do.
Archer	33 35	98 35	1894	8 25	8 02	County surveyor
Red River County	.. ..	.. ..	1874	9 30	8 11	Do.
Trinity River, Elm Fork	33 42	97 23	1854.5	10 36	8 47	J. Pope
Denison	33 43	96 33	1894	9 46	9 21	County surveyor
Paducah	34 03	100 12	1895	10 09	9 49	Do.
Plainview	34 09	101 34	1896	11 30	11 13	Do.
Quanah	34 16	99 42	1892	10 02	9 33	Do.
Panhandle	35 19	101 21	1888	11 13	10 36	Do.
Canadian	35 54	100 24	1889	11 04	10 29	Do.
Sherman Co., Okla. Line	.. ..	.. ..	1901.1	11 15	11 12	A. F. Loomis

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

UTAH

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group I	° ′	° ′		*East* ° ′	*East* ° ′	
Mount Ellen	38 07	110 49	1891.63	15 07.6	14 47	P. A. Welker
Beaver	38 16	112 38	1885.74	15 29.9	15 06	G. F. Bird
Tamarac	38 24	112 24	1885.62	15 37.0	15 12	Do.
Tushar	38 25	112 24	1885.66	15 22.0	14 57	Do.
Milford	38 25	113 00	1885.74	15 13.3	14 49	Do.
Mount Waas	38 32	109 14	1893.58	14 35.4	14 18	R. L. Faris
Warner Ranch	38 34	109 32	1893.61	15 10.9	14 53	Do.
Wasatch	39 07	111 27	1890.65	16 37.7	16 17	P. A. Welker
Deseret	39 18	112 38	1884.73	16 10.3	15 45	Eimbeck & Bird
Scipio	39 24	112 12	1884.67	16 10.1	15 44	Do.
Patmos Head	39 30	110 19	1890.81	15 54.0	15 32	P. A. Welker
Nephi	39 42	111 51	1883.85	16 27.2	16 00	Eimbeck & Bird
Mount Nebo	39 48	111 46	1887.57	16 17.2	15 53	Eimbeck & Turner
Provo	40 15	111 40	1883.86	16 31.6	16 03	Eimbeck & Bird
Mount Guyot (Deseret)	40 27	112 37	1892.67	16 42.9	16 28	P. A. Welker
Lake shore	40 40	112 26	1887.79	16 38.2	16 16	Eimbeck & Turner
Salt Lake	40 46	111 54	1893.43	16 22.0	16 06	R. L. Faris
City Creek	40 48	111 53	1893.42	16 35.7	16 20	W. Eimbeck
Waddoup	40 54	111 53	1892.41	16 34.7	16 17	R. L. Faris
Antelope	40 58	112 13	1892.75	16 18.3	16 01	Do.
Castle Rock	41 08	111 10	1878.80	16 57.1	16 24	J. B. Baylor
Ogden Peak	41 12	111 53	1888.71	17 25.8	17 02	J. H. Turner
Ogden	41 13	112 00	1886.71	17 24.6	17 00	R. A. Marr
Promontory	41 18	112 25	1892.55	17 07.4	16 50	P. A. Welker
Corinne	41 33	112 06	1881.35	17 30.9	17 00	Eimbeck & Marr
Kelton	41 45	113 08	1881.34	17 45.5	17 15	Do.
Group II						
Kanab	37 02	112 32	1872.5	14 23.0	13 53	Marshall & Austin
St. George	37 07	113 35	1871.5	16 27	16 00	Engineer officer
Camp on Virgin River	37 08	113 20	1872.5	15 29.0	15 02	R. L. Hoxie
Pahreah	37 11	111 53	1872.5	14 30	13 55	W. L. Marshall
Paria River	37 14	111 56	1872.5	14 13	13 38	R. L. Hoxie
Toquerville	37 15	113 16	1872.5	16 11.1	15 44	Engineer officer
Kane County, west	.. ..	... ..	1878	15 10	14 40	Mean, 9 stations
Washington County	.. ..	... ..	1873	15 56	15 29	Mean, 6 stations
Pine Valley, near	37 24	113 31	1872.5	16 00	15 33	W. L. Marshall
Water pocket, near Escalante River	37 28	111 02	1873.5	15 38.5	15 04	R. L. Hoxie
Iron City	37 33	113 27	1872.5	18 30	18 03	W. L. Marshall
Welcome Creek	37 34	111 27	1873.5	15 07	14 32	R. L. Hoxie
Asay Ranch	37 34	112 32	1872.5	16 51.0	16 20	Do.
Antelope Springs	37 46	113 26	1872.5	16 20.0	15 53	W. L. Marshall
Desert Spring	37 49	113 57	1872.5	16 20	15 53	Do.
Iron County, east	.. ..	... ..	1872	16 20	15 50	Mean, 5 stations
Iron County, west	.. ..	... ..	1879	15 46	15 20	Mean, 3 stations
Paragonah	37 55	112 48	1872.5	19 30	19 00	W. L. Marshall
Mammoth Mill	38 05	113 46	1873.5	15 52	15 25	R. L. Hoxie
Circleville	38 10	112 24	1872.5	21 30	21 00	—— Marie
Minersville	38 13	112 56	1872.5	16 30	16 00	W. L. Marshall
Fremont River	38 16	111 11	1873.5	16 20	15 45	R. L. Hoxie
Dirty Devil Canyon	38 17	111 00	1873.5	16 18	15 43	Do.
Fort Cameron	38 17	111 44	1873.5	16 24	15 49	G. M. Wheeler

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

UTAH—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Mill Spring Station	38 17	113 30	1872.5	17 20	16 53	R. L. Hoxie
Rabbit Valley	38 19	111 25	1873.5	16 20	15 45	Do.
Hay Spring	38 19	113 00	1872.5	16 15.6	15 46	Do.
Grass Spring	38 20	111 54	1872.5	17 45.2	17 10	W. L. Marshall
Wayne County	.. ..	... ..	1882	16 00	15 30	Mean, 8 stations
Piute County	.. ..	... ..	1871	16 05	15 30	Mean, 2 stations
Beaver County, east	.. ..	... ..	1882	15 50	15 25	Mean, 10 stations
Beaver County, west	.. ..	... ..	1871	16 34	16 05	Mean, 4 stations
San Francisco Spring	38 27	113 17	1872.5	16 58	16 30	R. L. Hoxie
Hawahwah Spring	38 30	113 30	1869.5	16 39.9	16 10	Wheeler & Lockwood
Grass Valley	38 34	111 50	1872.5	17 45	17 10	W. L. Marshall
Black Rock Spring	38 43	112 57	1872.5	16 02	15 32	R. L. Hoxie
Emery County, southwest	.. ..	... ..	1874	16 16	15 42	Mean, 4 stations
Sevier County	.. ..	... ..	1885	16 30	16 03	Mean, 19 stations
Gunnison Trail	38 48	111 30	1873.5	16 00	15 25	R. L. Hoxie
Camp, near Sevier Lake	38 50	113 15	1872.5	17 28	17 00	Do.
Millard County, southwest	.. ..	... ..	1875	16 30	16 04	Mean, 6 stations
Millard County, southeast	.. ..	... ..	1870	16 25	15 57	Mean, 5 stations
Meadow Creek	38 51	112 26	1872.5	16 11	15 40	R. L. Hoxie
Fillmore	38 57	112 17	1872.5	16 22.5	15 52	Hoxie, Wheeler, Austin
Muddy Creek	38 59	111 09	1873.5	16 00	15 25	R. L. Hoxie
Ferron Creek	39 05	111 07	1873.5	16 16	15 41	Do.
Cedar Springs	39 08	113 00	1872.5	17 09	16 40	—— Marie
Cottonwood Creek	39 14	111 03	1873.5	16 50	16 15	R. L. Hoxie
Sanpete County, south	.. ..	... ..	1891	16 25	16 06	Mean, 3 stations
Emery County, northwest	.. ..	... ..	1891	16 12	15 53	Mean, 12 stations
Millard County, northeast	.. ..	... ..	1881	16 20	15 50	Mean, 9 stations
Joe Valley	39 25	111 12	1873.5	17 00	16 25	R. L. Hoxie
Mount Pleasant	39 32	111 29	1873.5	17 10	16 35	Do.
Sevier Pass	39 33	112 17	1872.5	17 00	16 25	W. L. Marshall
Sanpete County, north	.. ..	... ..	1872	16 30	15 55	Mean, 7 stations
Carbon County	.. ..	... ..	1894	16 15	16 00	County surveyor
Sulphur	39 41	113 46	1859.5	15 56	15 35	J. H. Simpson
Juab County, east	.. ..	... ..	1875	16 45	16 11	Mean, 14 stations
Juab County, west	.. ..	... ..	1883	17 00	16 35	Mean, 2 stations
Fish Springs	39 52	113 21	1872.5	17 04.8	16 38	R. L. Hoxie
Eureka City	39 58	112 07	1872.5	17 09	16 35	W. L. Marshall
Santaquin	39 59	111 48	1872.5	17 26	16 51	Do.
Simpson Spring	40 02	112 47	1859.4	16 42	16 15	J. H. Simpson
Utah County, east	.. ..	... ..	1884	16 50	16 22	Mean, 6 stations
Utah County, west	.. ..	... ..	1889	16 30	16 07	Mean, 24 stations
Faust Station	40 12	112 27	1872.5	16 51.7	16 20	R. L. Hoxie
Tooele County, southeast	.. ..	... ..	1873	16 50	16 20	Mean, 15 stations
Tooele County, southwest	.. ..	... ..	1877	16 58	16 32	Mean, 2 stations
Fairfield	40 16	112 05	1872.5	16 59.5	16 25	R. L. Hoxie
Wasatch County, west	.. ..	... ..	1880	16 42	16 10	Mean, 7 stations
Uinta County, north	.. ..	... ..	1893	16 22	16 04	Do.
Salt Lake Base	40 35	111 10	1891.8	16 49.7	16 31	N. P. Anderson
Salt Lake County	.. ..	... ..	1880	16 30	15 58	Mean, 17 stations
Tooele County, northeast	.. ..	... ..	1889	16 25	16 05	Mean, 2 stations
Fort Douglas	40 46	111 50	1872.5	17 01	16 26	G. M. Wheeler
Salt Lake	40 46	111 54	1895	16 30	16 18	County surveyor
Summit County, west	.. ..	... ..	1881	16 57	16 26	Mean, 17 stations

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

UTAH—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Summit County, east	.. ..	... ..	1893	16 25	16 08	Mean, 2 stations
Schneider Creek	40 56	111 42	1858.9	19 55	19 24	J. H. Simpson
Farmington	40 59	111 55	1891	16 29	16 10	County surveyor
Davis County	.. ..	... ..	1888	17 02	16 38	Mean, 5 stations
Near Pilot Peak	41 01	113 59	1892.6	17 08.3	16 54	N. P. Anderson
Near Morgan	41 02	111 42	1889.7	16 19	15 57	Do.
Morgan County	.. ..	... ..	1879	16 44	16 12	Mean, 9 stations
Ogden	41 13	111 58	1895	16 30	16 18	County surveyor
Weber County	.. ..	... ..	1888	17 10	16 46	Mean, 8 stations
Boxelder County, west	.. ..	... ..	1888	17 41	17 21	Mean, 25 stations
Boxelder	41 30	112 02	1884.2	17 23.5	16 56	N. P. Anderson
Bear River	41 37	112 08	1881.7	17 30	17 00	Do.
NE. cor. T. 10 N., R. 3 E.	41 38	111 34	1891.6	17 44.4	17 29	Do.
Rich County	.. ..	... ..	1875	17 22	16 48	Mean, 4 stations
10 m. SE. of Laketown	41 45	111 10	1877.5	17 48	17 15	S. E. Tillman
Boxelder County, east	.. ..	... ..	1881	17 51	17 20	Mean, 35 stations
Cache County	.. ..	... ..	1892	17 30	17 12	Mean, 9 stations
Meadowville, near	41 51	111 22	1877.5	18 01	17 28	S. E. Tillman
Logan River, East Fork	41 56	111 33	1877.5	17 33	17 00	Do.

VERMONT

Group I	° ′	° ′		*West* ° ′	*West* ° ′	
Brattleboro	42 49	72 34	1898.84	11 38.3	11 45	E. Smith
Rutland	43 37	72 59	1898.80	12 01.8	12 09	Do.
Montpelier	44 15	72 32	1898.82	13 49.5	13 56	Do.
Burlington	44 29	73 12	1898.81	12 30.6	12 38	Do.
Group II						
Pownal	42 46	73 13	1786.5	5 52	11 50	—— Williams
Newfane	43 00	72 39	1901.2	12 25	12 27	C. E. Skinner
Bellows Falls	43 09	72 28	1876.6	11 06.7	12 20	F. E. Hilgard
Winhall	43 10	72 48	1895	12 15	12 30	County surveyor
Woodstock	43 36	72 35	1897.0	12 30	12 41	H. F. Dunham
White River Junction	43 40	72 18	1876.6	11 05.3	12 19	F. E. Hilgard
West Hartford	43 42	72 22	1860.2	11 09	13 31	J. M. Clark
South Newbury	44 03	72 06	1901.2	11 58	12 00	Irving Abbott
Wells River	44 09	72 05	1876.6	11 54.5	13 08	F. E. Hilgard
Ryegate	44 10	72 10	1801.5	7 00	12 50	J. Whitelaw
St. Johnsbury	44 26	71 55	1837.5	9 16	13 19	A. C. Turning
Essex Junction	44 31	73 06	1849.6	9 24	12 34	J. M. Clark
Johnson	44 37	72 41	1900.3	15 20	15 23	C. H. Cristy
Barton	44 44	72 11	1837.5	10 51	14 54	A. C. Turning
North Hero	44 50	73 17	1895	13 00	13 15	County surveyor
Swanton Falls	44 56	73 09	1850.3	11 28	14 35	J. M. Clark
Derby	45 00	72 12	1876.6	13 18.2	14 32	F. E. Hilgard

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

VIRGINIA

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group I	° ′	° ′		*E or W* ° ′	*West* ° ′	
Dismal Swamp, B. stone	36 33	76 23	1886.95	3 15.9 W	4 02	C. H. Sinclair
Hines, N. C. boundary	36 33	76 34	1887.11	3 04.7 W	3 51	Do.
Knott Island, north end	36 34	75 55	1873.30	2 54.8 W	4 31	A. T. Mosman
Bristol	36 36	82 10	1898.35	0 21.2 W	0 33	E. Smith
Stuart	36 39	80 16	1901.78	1 53.0 W	1 54	W. F. Wallis
Stuart, S. M.	.. ..	.. ..	1901.79	1 47.5 W	1 48	Do.
Emporia	36 40	77 32	1897.40	3 29.2 W	3 42	J. B. Baylor
White Rock	36 40	83 27	1893.54	0 18.4 E	0 09	A. H. Buchanan
Big Knob	36 40	82 30	1893.7	0 19.2 W	0 46	Do.
Rogers	36 40	81 33	1894.6	0 13.5 E	0 10	Do.
Old Town	36 40	80 57	1902.48	0 36.4 W	0 35	E. D. Preston
Abingdon	36 42	81 58	1897.58	0 12.9 W	0 27	O. B. French
Martinsville, school grounds	36 42	79 52	1901.77	1 59.9 W	2 01	W. F. Wallis
Martinsville, 300 feet south	.. ..	.. ..	1901.77	2 32.1 W	2 33	Do.
Martinsville, N. M.	36 42	79 53	1901.80	2 28.8 W	2 29	Do.
Martinsville, S. M.	.. ..	.. ..	1901.80	2 11.0 W	2 12	Do.
Houston	36 46	78 56	1897.57	2 23.9 W	2 37	O. B. French
Hillsville	36 47	80 44	1902.47	0 54.3 W	0 53	E. D. Preston
Buffalo	36 48	80 29	1895.73	0 08.9 W	0 29	A. H. Buchanan
Chatham	36 50	79 23	1901.81	2 15 W	2 16	W. F. Wallis
Chatham, S. M.	.. ..	.. ..	1901.81	2 31.2 W	2 32	Do.
Chatham, N. M.	.. ..	.. ..	1901.81	2 13.4 W	2 14	Do.
Marion	36 50	81 31	1898.36	1 02.0 W	1 13	E. Smith
Norfolk	36 52	76 16	1897.39	4 17.8 W	4 31	J. B. Baylor
Cape Henry	36 56	76 00	1895.45	3 56.5 W	4 16	Do.
Wytheville	36 57	81 04	1898.37	0 49.4 W	1 01	E. Smith
Rocky Mount	37 00	79 53	1901.76	1 52.4 W	1 53	W. F. Wallis
Old Point Comfort	37 00	76 18	1902.02	4 20 W	4 20	E. Smith
Smithville, N. M.	37 04	78 40	1901.87	2 42.6 W	2 43	W. F. Wallis
Smithville, S. M.	.. ..	.. ..	1901.87	2 42.4 W	2 43	Do.
Pulaski City	37 04	80 47	1902.46	1 12.6 W	1 11	E. D. Preston
Dinwiddie, N. M.	37 05	77 35	1901.90	3 12.5 W	3 13	W. F. Wallis
Dinwiddie, S. M.	.. ..	.. ..	1901.90	3 17.3 W	3 18	Do.
Cape Charles	37 07	75 58	1856.68	1 35.2 W	4 13	C. A. Schott
Tazewell	37 07	81 31	1898.38	1 40.6 W	1 52	E. Smith
Christiansburg	37 08	80 24	1897.59	0 58.7 W	1 13	O. B. French
Nottoway, S. M.	37 08	78 06	1901.88	3 12.0 W	3 12	W. F. Wallis
Nottoway, N. M.	.. ..	.. ..	1901.88	3 17.8 W	3 18	Do.
Petersburg, S. M.	37 14	77 23	1901.89	3 36.4 W	3 37	W. F. Wallis
Petersburg, N. M.	.. ..	.. ..	1901.89	3 44.3 W	3 45	Do.
York River	37 15	76 24	1902.02	4 26 W	4 26	E. Smith
Williamsburg	37 16	76 43	1887.28	3 02.9 W	3 48	J. B. Baylor
Cape Charles City	37 16	76 02	1900.41	4 17.1 W	4 21	Do.
Rustburg	37 17	79 06	1901.74	3 29.3 W	3 30	W. F. Wallis
Farmville, S. M.	37 18	78 25	1901.83	3 09.4 W	3 10	Do.
Farmville, N. M.	.. ..	.. ..	1901.83	3 10.1 W	3 11	Do.
Scott	37 20	75 54	1856.68	1 37.5 W	4 16	C. A. Schott
Salem	37 20	80 06	1900.41	1 24.7 W	1 29	J. D. Thompson
Bedford City	37 20	79 31	1902.43	3 35.7 W	3 35	E. D. Preston
Pearisburg	37 21	80 44	1902.46	2 02.5 W	2 01	Do.
Charles City, S. M.	37 21	77 03	1901.66	4 41.7 W	4 43	W. F. Wallis
Charles City, N. M.	.. ..	.. ..	1901.66	4 38.8 W	4 40	Do.
Amelia, N. M.	37 21	77 59	1901.86	3 54.4 W	3 55	Do.
Amelia, S. M.	.. ..	.. ..	1901.86	3 53.6 W	3 54	Do.
West Appomattox	37 22	78 50	1901.81	2 17.0 W	2 18	Do.
West Appomattox, S. M.	.. ..	.. ..	1901.82	1 25.1 W	1 26	Do.

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

VIRGINIA—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group I—Continued	° ′	° ′		*E or W* ° ′	*West* ° ′	
Appomattox	37 23	78 48	1901.82	3 31.1 W	3 32	W. F. Wallis
Wolftrap	37 24	76 15	1871.36	2 49.3 W	4 33	A. T. Mosman
Lynchburg	37 25	79 09	1901.73	2 24.8 W	2 26	W. F. Wallis
Fincastle	37 30	79 53	1902.44	1 25.4 W	1 24	E. D. Preston
Cumberland, N. M.	37 31	78 15	1901.84	3 46.7 W	3 47	W. F. Wallis
Cumberland, S. M.	.. ..	.. ..	1901.84	3 46 W	3 46	Do.
New Kent	37 31	76 59	1901.64	4 10.3 W	4 11	Do.
New Castle	37 31	80 06	1902.45	1 42.0 W	1 41	E. D. Preston
Richmond	37 33	77 28	1901.63	3 45.0 W	3 46	W. F. Wallis
Powhatan, N. M.	37 33	77 55	1901.85	3 44.0 W	3 44	Do.
Powhatan, S. M.	.. ..	.. ..	1901.85	3 43.0 W	3 43	Do.
Buckingham	37 34	78 32	1901.67	4 19.5 W	4 20	Do.
Amherst	37 36	79 03	1901.73	2. 43.7 W	2 44	Do.
Rappahannock River	37 37	76 18	1902.02	4 42 W	4 42	E. Smith
Natural Bridge	37 38	79 32	1900.32	1 52.8 W	1 58	Brown&Thompson
Goochland	37 41	77 54	1901.66	3 50.8 W	3 52	W. F. Wallis
Accomac	37 41	75 42	1897.38	4 44.9 W	4 58	J. B. Baylor
Joynes	37 42	75 37	1856.68	2 03.3 W	4 41	C. A. Schott
Lovingston	37 46	78 53	1901.71	2 36.7 W	2 38	W. F. Wallis
North Mountain	37 46	79 44	1884.14	1 05.1 W	2 06	J. B. Baylor
Lexington	37 47	79 27	1897.60	2 06 W	2 20	O. B. French
Tangier Island	37 48	75 59	1871.47	3 03.2 W	4 46	A. T. Mosman
Covington	37 48	79 59	1900.33	2 01 W	2 06	J. D. Thompson
Palmyra	37 51	78 16	1901.68	5 22.3 W	5 23	W. F. Wallis
Palmyra, S. M	.. ..	.. ..	1901.69	4 28.4 W	4 29	Do.
Palmyra, N. M	.. ..	.. ..	1901.69	4 28 W	4 29	Do.
Snead	37 58	75 26	1856.67	2 18.4 W	4 56	C. A. Schott
Goshen	37 59	79 30	1900.48	2 26.7 W	2 31	W. M. Brown
Louisa	38 02	78 00	1901.70	5 02.1 W	5 03	W. F. Wallis
Charlottesville	38 03	78 30	1901.70	3 37.2 W	3 35	Do.
Greenwood	38 03	78 47	1900.33	3 32.1 W	3 37	W. M. Brown
Warm Springs	38 03	79 45	1900.48	2 25.4 W	2 30	Do.
Staunton	38 09	79 04	1900.41	2 33.8 W	2 39	Brown&Thompson
Orange	38 14	78 06	1900.34	2 55.1 W	3 00	W. M. Brown
Burketown	38 18	78 56	1900.49	2 52.4 W	2 57	Do.
Stanardsville	38 18	78 27	1900.51	3 25.6 W	3 30	Do.
Fredericksburg	38 18	77 27	1900.35	4 12.0 W	4 17	Do.
Clark Mountain	38 19	78 00	1871.64	1 46.8 W	3 32	C. O. Boutelle
Madison	38 23	78 15	1900.51	4 53.7 W	4 58	W. M. Brown
Elkton	38 24	78 37	1900.51	3 09.8 W	3 14	Do.
Monterey	38 25	79 35	1900.44	2 55.0 W	3 00	Do.
Stafford	38 25	77 24	1900.62	4 20..4 W	4 25	J. W. Miller
Harrisonburg	38 27	78 52	1900.49	2 58.2 W	3 03	W. M. Brown
Culpeper	38 29	77 59	1000.31	2 00.8 W	2 06	Brown&Thompson
Calverton	38 38	77 41	1900.34	3 42.7 W	3 48	J. A. Fleming
Luray	38 40	78 27	1900.53	3 20.7 W	3 25	W. M. Brown
Alwington	38 42	77 47	1900.34	8 25.7 W	8 31	L. A. Bauer
Washington	38 43	78 10	1900.52	3 40.0 W	3 44	W. M. Brown
Manassas	38 45	77 30	1900.30	4 17.1 W	4 22	Brown&Thompson
Fairfax Court-House	38 51	77 18	1900.62	4 35.3 W	4 39	J. W. Miller
Woodstock	38 52	78 32	1897.62	3 45.5 W	3 59	O. B. French
Bull Run	38 53	77 42	1871.79	4 21.3 W	6 04	C. O. Boutelle
Cherrydale	38 54	77 07	1900.48	5 19.1 W	5 24	E. D. Preston
Rectortown	38 54	77 53	1900.39	3 12.9 W	3 18	W. M. Brown
Peach Grove	38 55	77 14	1869.84	2 54.7 W	4 44	C. O. Boutelle
Front Royal	38 55	78 12	1900.52	3 52.8 W	3 57	W. M. Brown

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

VIRGINIA—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group I—Continued	° ′	° ′		*E or W* ° ′	*West* ° ′	
Strasburg	38 59	78 21	1900.39	3 50.6 W	3 55	W. M. Brown
Leesburg	39 07	77 34	1900.61	4 46.2 W	4 50	J. W. Miller
Round Hill	39 08	77 46	1900.61	4 24.4 W	4 29	Do.
Winchester	39 10	78 10	1900.40	4 24.0 W	4 29	W. M. Brown
Group II						
South boundary, at shore	36 33	75 52	1728.2	3 00 W	. .	W. Byrd
Whaleyville	36 35	76 41	1900.5	4 06 W	4 10	B. P. Baker
N. C. line, Brunswick and Greenesville counties	36 36	77 48	1824.0	0 55 E	3 15	—— Boye
N. C. line, Peach Bottom	36 36	81 00	1824.0	3 50 E	0 14	Do.
Danville	36 37	79 25	1873.6	1 16.3 W	2 54	F. E. Hilgard
Washington County	36 38	81 47	1892.7	0 08 E	0 22	F. D. Leffingwell
Emory and Henry College	36 40	81 46	1881.2	1 00 E	0 12	J. A. Davis
Franklin	36 41	76 58	1901.2	2 10 W	2 12	I. C. Wills
Jonesville	36 41	83 08	1890	0 30 E	0 07	County surveyor
Hill Station	36 41	82 43	1901.2	0 30 E	0 28	Milo Taylor
Nansemond County	.. ..	.. ..	1895	2 57 W	3 16	County surveyor
Houston	36 46	78 55	1901.5	2 39 W	2 41	C. R. French
Meadville	36 47	79 02	1886.1	1 30 W	2 22	M. French
Gosport Navy-Yard	36 49	76 17	1865.8	2 37.8 W	4 42	W. Harkness
Mount Airy	36 52	79 11	1873.6	0 55.2 E	0 42	F. E. Hilgard
Isle of Wight	36 54	76 45	1901.2	3 30 W	3 32	J. O. Branch
Floyd County	.. ..	.. ..	1895	4 30 W	4 51	County surveyor
Gratton	37 08	81 25	1896.5	1 00 W	1 18	A. G. Cox
Christiansburg	37 08	80 29	1900	1 20 W	1 24	W. F. Wall
Prices Fork	37 13	80 35	1900	1 17 W	1 21	Do.
Burkeville	37 13	78 12	1873.6	1 59.7 W	3 38	F. E. Hilgard
Montgomery Co., NW. cor.	37 16	80 40	1900	1 08 W	1 12	W. F. Wall
Pembroke	37 18	80 44	1882	2 00 W	3 07	County surveyor
Mobjack Bay	37 18	76 20	1824.0	0 37 W	4 47	—— Boye
Craigs Creek	37 19	80 26	1900	1 31 W	1 35	W. F. Wall
Simmonsville	37 23	80 29	1894	0 54 W	1 18	County surveyor
Mathews	37 25	76 20	1901.2	4 48 W	4 50	Lemuel Foster
Scottsville	37 30	77 54	1879.5	2 30 W	3 43	County surveyor
Cumberland	37 31	78 18	1895	3 00 W	3 20	Do.
Amherst	37 35	79 04	1878	2 00 W	3 22	Do.
Glasgow	37 37	79 30	1889.9	1 37 W	2 16	I. C. Walker
Accomac	37 41	75 42	1900.8	4 46 W	4 49	F. E. Ruediger
Buffalo Forge	37 41	79 26	1901.2	2 20 W	2 22	C. A. Brady
King William	37 42	77 05	1896	3 15 W	3 31	County surveyor
Lancaster	37 45	76 30	1890	4 00 W	4 34	Do.
Essex County	.. ..	.. ..	1895	4 00 W	4 19	Do.
Sparta	37 58	77 15	1893	3 35 W	4 00	Do.
Louisa County	.. ..	.. ..	1901.2	3 25 W	3 27	J. W. Nunn
New London	38 08	77 19	1901.2	4 50 W	4 52	F. M. Travis
Spottsylvania	38 12	77 38	1895	3 30 W	3 49	County surveyor
Comorn	38 16	77 13	1901.2	4 00 W	4 02	T. T. Arnold
Indiantown	38 21	77 49	1901.2	5 00 W	5 02	E. J. Woodville
Harrisonburg	38 27	78 52	1901.2	3 12 W	3 14	J. Hanze
Bealeton	38 34	77 48	1895	4 10 W	4 30	County surveyor
Flint Hill	38 46	78 07	1901.2	4 10 W	4 12	J. E. Sutphin
Farmwell	39 02	77 27	1895	3 00 W	3 20	County surveyor

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

WASHINGTON

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group I	° ′	° ′		*East* ° ′	*East* ° ′	
Vancouver, near Fort Vancouver	45 38	122 40	1895. 17	21 32. 4	21 34	J. J. Gilbert
Lower Cascades	45 39	122 00	1881. 80	19 29. 3	19 40	J. S. Lawson
Walla Walla	46 04	118 21	1887. 71	21 10. 3	21 06	E. Smith
Wallula	46 07	118 55	1881. 75	19 55. 7	19 53	J. S. Lawson
Ainsworth	46 14	119 03	1881. 64	21 24. 5	21 22	Do.
Cape Disappointment	46 17	124 03	1895. 15	21 55. 8	22 03	J. J. Gilbert
Pomeroy	46 31	117 40	1881. 72	21 33. 5	21 28	J. S. Lawson
Sixty Mile Well	46 49	118 50	1881. 65	22 46. 9	22 44	Do.
Olympia	47 02	122 54	1881. 84	21 34. 6	21 46	Do.
Howard, near Olympia	47 03	122 53	1894. 96	22 43. 3	22 44	J. J. Gilbert
Tacoma	47 16	122 27	1894. 42	22 30. 8	22 32	G. Davidson
Sprague	47 19	118 00	1881. 65	22 55. 4	22 52	J. S. Lawson
Seattle, old Univ. grounds	47 36	122 20	1900. 86	22 56. 7	22 57	W. Weinrich
Seattle, new Univ. grounds	47 40	122 18	1900. 90	22 47. 5	22 48	Do.
Spokane Falls	47 40	117 26	1881. 67	21 39. 4	21 34	J. S. Lawson
Everett	47 58	122 13	1900. 88	23 15. 3	23 15	W. Weinrich
Port Townsend	48 07	122 45	1894. 88	22 50. 9	22 52	J. J. Gilbert
Striped Peak	48 10	123 41	1893. 51	23 12. 3	23 14	Do.
Dungeness	48 11	123 07	1892. 68	23 26. 1	23 28	Do.
Slip	48 16	124 14	1893. 56	23 30. 6	23 39	Do.
Cape Flattery & Neah Bay	48 22	124 38	1881. 78	22 44. 2	22 55	H. E. Nichols
Waadah	48 23	124 36	1893. 64	23 26. 3	23 35	J. J. Gilbert
Mount Vernon	48 24	122 21	1900. 88	23 08	23 08	W. Weinrich
Classet	48 24	124 40	1893. 71	23 06. 4	23 15	J. J. Gilbert
Tatoosh	48 24	124 44	1893. 72	23 45. 1	23 53	Do.
San Juan Island	48 28	122 58	1897. 61	23 31. 4	23 33	Do.
Bellevue	48 32	123 10	1894. 42	26 48	26 50	Do.
Mat	48 33	122 57	1894. 57	23 18	23 20	Do.
Slope	48 33	123 00	1894. 57	23 22	23 24	Do.
Bamboo	48 34	123 01	1894. 56	23 42	23 44	Do.
Windlass	48 35	123 10	1894. 46	23 20	23 22	Do.
Shaw Island	48 36	122 58	1895. 64	23 43. 6	23 45	F. A. Young
Goose	48 36	123 02	1894. 53	23 33	23 35	J. J. Gilbert
Clover	48 36	123 10	1894. 47	22 50	22 52	Do.
Root	48 37	122 57	1894. 54	23 11	23 13	Do.
Fairview	48 38	123 02	1894. 52	23 55	23 57	Do.
Morse Island	48 38	123 11	1894. 43	23 30	23 32	Do.
Spieden	48 38	123 06	1894. 52	23 29	23 31	Do.
Limestone	48 39	123 00	1894. 51	23 36	23 38	Do.
Middleton	48 42	123 04	1894. 47	22 36	22 38	Do.
Doughty	48 43	122 57	1894. 51	23 27	23 29	Do.
Dry	48 43	123 02	1894. 49	25 11	25 13	Do.
New Whatcom	48 44	122 29	1900. 87	23 20. 6	23 21	W. Weinrich
Patos	48 47	122 58	1894. 50	23 04	23 06	J. J. Gilbert
Russell	49 00	118 13	1901. 59	23 11. 7	23 12	C. H. Sinclair
Group II						
Skamania Co., T. 1 N., R. 5 E.	45 35	122 12	1901. 3	20 22	20 22	H. Bueche
Skamania Co., T. 3 N., R. 8 E.	45 43	121 50	1901. 4	21 50	21 50	Do.
Skamania Co., T. 3 N., R. 10 E.	45 44	121 33	1901. 4	21 26	21 26	Do.
Klickitat County	.. ..	.... ..	1874	20 54	21 06	Mean, 8 stations
Small I., Columbia River	45 52	119 39	1860. 5	18 00	18 28	S. Garfielde
Chequees	45 56	121 23	1854. 0	16 05	17 10	J. Pope

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

WASHINGTON—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Skamania County	.. ..	.... ..	1893	23 15	23 17	Mean, 3 stations
Columbia River, Township 6	46 00	118 58	1860.5	18 50	19 12	S. Garfielde
Near Wallula	46 02	119 00	1860.0	19 46	20 09	J. S. Harris
Cowlitz County	.. ..	.... ..	1877	21 35	21 52	Mean, 8 stations
Monticello	46 07	122 55	1857.5	19 50	20 45	S. Garfielde
Dry Creek	46 09	118 18	1860.0	20 13	20 36	J. S. Harris
Near Mount Adams	46 12	121 03	1860.5	20 30	21 18	S. Garfielde
Wallawalla County	.. ..	.... ..	1878	20 50	20 50	Mean, 4 stations
Asotin County	.. ..	.... ..	1876	21 35	21 35	Mean, 3 stations
Wahkiakum Co., average	.. ..	.... ..	1901.3	21 46	21 46	T. H. Allman
Snake R., Col. Guide Mer.	46 15	118 58	1860.5	20 00	20 22	S. Garfielde
Strong River, mouth	46 15	123 23	1855.5	20 00	21 00	Do.
Magnetic station	46 18	117 51	1860.5	18 45	19 07	Do.
Grays Bay, Columbia River	46 18	123 42	1858.5	21 37.5	22 30	Do.
Columbia County	.. ..	.... ..	1861	21 00	21 20	Mean, 4 stations
Garfield County	.. ..	.... ..	1870	21 26	21 31	Mean, 3 stations
Pataha Creek crossing	46 23	117 34	1863.5	21 15	21 20	S. Garfielde
Evans Landing	46 26	117 17	1900.6	21 25	21 23	F. Gilham
Franklin County	.. ..	.... ..	1866	21 10	21 23	Mean, 6 stations
Yakima County	.. ..	.... ..	1874	21 04	21 16	Mean, 47 stations
Fort Simcoe	46 30	120 40	1865.5	21 30	21 56	S. Garfielde
Tukannon River	46 32	118 00	1860.0	20 55	21 18	J. S. Harris
Willapa Bay, east side	46 33	123 54	1856.5	20 30	21 28	S. Garfielde
Snake River crossing	46 34	118 04	1860.5	19 00	19 22	Do.
Columbia River crossing	46 34	119 18	1863.5	21 30	21 48	Do.
Lewis County	.. ..	.... ..	1876	21 21	21 39	Mean, 12 stations
Pacific County	.. ..	.... ..	1880	21 42	22 00	Mean, 9 stations
Leadbetter Point	46 36	124 03	1859.5	21 05	22 00	S. Garfielde
Willapa Bay Light-House	46 43	124 04	1858.5	21 05	22 03	Do.
Cow Creek	46 53	118 10	1860.0	21 01	21 24	J. S. Harris
Thurston County	.. ..	.. ..	1868	21 37	22 08	Mean, 8 stations
Whitman County	.. ..	.. ..	1871	20 49	20 50	Mean, 11 stations
Grays Harbor, 4th St. Par.	46 54	124 01	1855.5	22 00	23 06	S. Garfielde
Chehalis Point	46 55	124 07	1858.5	21 30	22 28	Do.
Chikeeles Point	46 56	124 12	1841	21 23	23 10	C. Wilkes
Aberdeen	46 57	123 50	1894	22 30	22 35	County surveyor
Adams County	.. ..	.... ..	1872	21 18	21 24	Mean, 10 stations
Grays Harbor, North Head	47 03	124 05	1858.5	21 30	22 28	S. Garfielde
Pierce County	.. ..	.... ..	1873	21 15	21 38	Mean, 11 stations
Nisqually	47 07	122 38	1859.5	21 23	22 13	R. W. Haig
Lugenbeel Creek	47 09	118 06	1860.0	20 55	21 15	J. S. Harris
Steilacoom	47 10	122 35	1856.5	21 30	22 28	S. Garfielde
Chehalis County	.. ..	.... ..	1884	22 08	22 20	Mean, 14 stations
Fifth St. Par. at Hoods Canal	47 15	123 08	1856.5	21 35	22 33	S. Garfielde
Fifth St. Par. at ocean	47 15	124 12	1859.5	21 45	22 40	Do.
Magnetic station	47 16	122 05	1855.5	21 00	22 01	Do.
Puget Sd., Narrows at entr.	47 18	122 31	1841	22 28.7	24 09	C. Wilkes
Case Inlet	47 20	122 48	1841	22 28.7	24 09	Do.
Carr Inlet	47 20	122 40	1841	22 28.7	24 09	Do.
Mason County	.. ..	.... ..	1874	21 38	22 00	Mean, 5 stations
Kittitas County	.. ..	.... ..	1880	21 40	21 45	Mean, 12 stations
Douglas County	.. ..	.... ..	1887	22 16	22 16	Mean, 19 stations
King County	.. ..	.... ..	1871	21 57	22 23	Mean, 18 stations
Hoods Canal, head	47 28	122 50	1856.5	21 30	22 28	S. Garfielde

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

WASHINGTON—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		East ° ′	East ° ′	
Wenatshapaw	47 29	120 38	1854.0	18 50	19 40	J. Pope
Restoration Point	47 30	122 14	1892.4	19 36	.. ..	G. Vancouver
Point Moore	47 36	122 22	1841	21 53.0	23 33	C. Wilkes
Magnetic station	47 36	121 42	1865.5	22 20	22 57	S. Garfielde
Lincoln County	.. ..	.... ..	1874	21 41	21 45	Mean, 9 stations
Spokane County	.. ..	.... ..	1896	22 03	22 00	Mean, 7 stations
Seabeck, Hoods Canal	47 39	122 49	1859.5	22 00	22 50	S. Garfielde
Pasisi Point	47 40	122 51	1841	21 00.0	22 40	C. Wilkes
Port Madison Mill	47 43	122 33	1856.5	20 00	20 58	S. Garfielde
Kitsap County	.. ..	.... ..	1894	22 30	22 32	1 station
Peon Prairie	47 44	117 14	1860.0	21 53	22 10	J. S. Harris
Skookum Chuck, mouth	47 45	122 40	1856.5	21 00	21 58	S. Garfielde
Jefferson County, average	.. ..	.... ..	1900	22 30	22 30	Surveyors
Bremerton	47 34	122 38	1897.3	23 06	23 07	C. Thomas
Rose Point	47 47	122 50	1841	21 00.0	22 40	C. Wilkes
Appletree Cove	47 47	122 28	1841	21 11.0	22 51	Do.
Spokane Ferry	47 49	117 49	1860.0	22 07	22 25	J. S. Harris
Port Gamble Mill	47 51	122 34	1859.5	20 50	21 40	S. Garfielde
Pilot Cove Anchorage	47 52	122 29	1841	21 00.0	22 40	C. Wilkes
Suquamish Harbor	47 52	122 39	1841	21 00.0	22 40	Do.
Port Ludlow	47 55	122 40	1841	21 00.0	22 40	Do.
Columbia Guide Mer.	47 55	118 58	1860.5	22 00	22 22	S. Garfielde
Foulweather Bluff	47 56	122 36	1859.5	20 30	21 20	Do.
Point Elliott	47 57	122 18	1855.5	21 30	22 30	Do.
Chemikane River	48 00	117 45	1861.5	21 28	21 45	R. W. Haig
Port Gardner	48 00	122 17	1841	20 47.0	22 27	C. Wilkes
Port Discovery Mill	48 01	122 51	1862.5	22 00	22 44	S. Garfielde
Holmes Hbr., Whidlby I.	48 05	122 31	1841	20 40.0	22 20	C. Wilkes
Snohomish County	.. ..	.... ..	1880	22 29	22 42	Mean, 13 stations
Clallam County	.. ..	.... ..	1884	22 26	22 40	Mean, 27 stations
Port Angeles	48 07	123 26	1897.4	23 22	23 25	C. Thomas
Island County	.. ..	.... ..	1856	21 30	22 28	1 station
Admiralty Head, Whidlby I.	48 09	122 41	1857.5	21 54	22 50	S. Garfielde
Port Wilson	48 09	122 45	1841	20 27.2	22 07	C. Wilkes
Port Susan	48 11	122 20	1841	20 35.0	22 15	Do.
Dungeness Light	48 11	123 06	1858.5	21 30	22 23	S. Garfielde
Couperville	48 13	122 41	1901.2	22 45	22 45	A. J. Morrill
Penns Cove	48 14	122 40	1841	20 40.0	22 20	C. Wilkes
Clallam Bay	48 15	124 16	1864.5	22 30	23 15	S. Garfielde
Juan de Fuca Strait	48 17	123 11	1841	20 40	22 20	C. Wilkes
Deception Passage	48 24	122 39	1858.5	21 45	22 38	S. Garfielde
Juan de Fuca Strait	48 25	124 27	1841	22 30	24 10	C. Wilkes
Perry Island	48 28	122 40	1841	20 40.0	22 20	Do.
Skagit County	.. ..	.... ..	1882	22 19	22 30	Mean, 7 stations
Stevens County	.. ..	.... ..	1876	23 00	23 00	Mean, 5 stations
Okanogan County	.. ..	.... ..	1883	22 32	22 35	Mean, 2 stations
Conconully	48 32	119 56	1890	22 55	22 54	County surveyor
Hornet Harbor	48 32	122 32	1841	20 40.0	22 20	C. Wilkes
Bellingham Bay, Guide Mer.	48 33	122 27	1859.5	22 09	23 00	S. Garfielde
Colville Depot	48 34	117 52	1860.0	22 31	22 50	J. S. Harris
Strawberry Bay	48 34	122 42	1841	20 40.0	22 20	C. Wilkes
Colville Barracks	48 40	118 05	1861.5	21 40	21 56	R. W. Haig
Fort Bellingham	48 47	122 32	1859.5	22 30	23 20	S. Garfielde
Whatcom County	.. ..	.... ..	1879	22 35	22 49	Mean, 8 stations

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

WASHINGTON—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Birch Bay	48 55	122 45	1841	20 40.0	22 20	C. Wilkes
Point Roberts	48 59	122 58	1860.0	22 39	23 28	J. S. Harris
Magnetic Station	48 59	121 42	1860.0	22 47	23 36	Do.
Do.	48 59	121 57	1860.0	22 39	23 28	Do.
Do.	49 00	118 44	1860.0	22 07	22 30	Do.
Do.	49 00	119 35	1860.0	23 34	24 00	Do.
Drayton Cove	49 00	122 45	1841	20 40.0	22 20	C. Wilkes

WEST VIRGINIA

Group I	° ′	° ′		*E or W* ° ′	*West* ° ′	
Princeton	37 22	81 07	1900.41	1 23.1 W	1 28	J. D. Thompson
Welch	37 26	81 35	1900.42	2 20.4 W	2 25	Do.
Baileysville	37 36	81 40	1900.43	1 42.4 W	1 47	Do.
Hinton	37 40	80 53	1900.34	1 24.7 W	1 30	Do.
Williamson	37 40	82 16	1900.44	1 45.8 W	1 50	Do.
Oceana	37 42	81 38	1900.43	1 26.1 W	1 31	Do.
Alderson	37 43	80 39	1898.42	1 58.6 W	2 10	E. Smith
Beckley	37 47	81 12	1900.35	1 48.2 W	1 53	J. D. Thompson
Lewisburg	37 48	80 27	1900.34	1 56.2 W	2 01	Do.
Logan	37 51	81 59	1900.45	0 55.1 W	1 00	Do.
Dunlow	38 02	82 26	1898.39	1 11.4 W	1 23	E. Smith
Fayetteville	38 03	81 06	1900.36	2 01.6 W	2 07	J. D. Thompson
Madison	38 04	81 48	1900.45	1 24.6 W	1 29	Do.
Marlinton	38 13	80 06	1900.45	1 47.2 W	1 32	W. M. Brown
Wayne	38 13	82 26	1898.40	0 44.6 W	0 56	E. Smith
Hamlin	38 17	82 06	1900.46	1 50.6 W	1 55	J. D. Thompson
Summersville	38 17	80 51	1900.36	1 13.0 W	1 18	Do.
Charleston	38 21	81 38	1900.37	2 06.7 W	2 12	Do.
St. Albans, East Base	38 23	81 48	1893.08	1 06.7 W	1 38	W. B. Fairfield
St. Albans, West Base	38 23	81 50	1893.10	1 34.5 W	2 05	Do.
Ryan	38 24	81 48	1892.94	1 10.8 W	1 42	Do.
Huntington	38 26	82 27	1898.41	0 51.2 W	1 03	E. Smith
Clay	38 28	81 05	1900.37	1 15.9 W	1 21	J. D. Thompson
Addison	38 28	80 24	1900.47	2 26.2 W	2 31	W. M. Brown
Mingo	38 29	80 03	1900.46	2 30.0 W	2 35	Do.
Winfield	38 32	81 55	1900.38	1 46.6 W	1 51	J. D. Thompson
Travellers Repose	38 32	79 47	1900.45	2 34.6 W	2 39	W. M. Brown
Cave	38 33	79 27	1900.44	2 54.9 W	3 00	Do.
Franklin	38 39	79 20	1900.44	2 56.2 W	3 01	Do.
Pickens	38 39	80 13	1898.51	2 45.8 W	2 57	E. Smith
Sutton	38 39	80 43	1898.49	2 16.3 W	2 28	Do.
Brushyrun	38 50	79 15	1900.43	3 05.3 W	3 10	W. M. Brown
Beverly	38 50	79 53	1898.58	2 45.3 W	2 57	E. Smith
Ripley	38 50	81 43	1900.40	1 39.2 W	1 44	J. D. Thompson
Point Pleasant	38 50	82 09	1864.08	1 34.9 E	0 52	A. T. Mosman
Glebe	38 59	79 13	1900.43	3 19.3 W	3 24	W. M. Brown
Buckhannon	38 59	80 14	1898.50	3 00.0 W	3 11	E. Smith
Weston	39 02	80 28	1898.51	2 31.3 W	2 43	Do.
Moorefield	39 04	78 58	1900.42	3 18.6 W	3 23	W. M. Brown

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

WEST VIRGINIA—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group I—Continued	° ′	° ′		*E or W* ° ′	*West* ° ′	
Hendricks	39 04	79 38	1898.58	2 55.3 W	3 06	E. Smith
Philippi	39 08	80 03	1898.57	3 27.0 W	3 38	Do.
Falls	39 10	79 07	1900.42	3 28.9 W	3 34	W. M. Brown
Harrisville	39 11	81 03	1898.47	1 25.8 W	1 37	E. Smith
Parkersburg	39 16	81 34	1898.46	1 13.7 W	1 25	Do.
Charlestown	39 17	77 51	1900.24	4 01.3 W	4 06	Fleming&Thompson
Clarksburg	39 17	80 20	1898.48	2 49.5 W	3 01	E. Smith
West Union	39 18	80 48	1900.39	0 43.0 W	0 48	J. D. Thompson
Romney	39 21	78 43	1900.24	4 03.6 W	4 09	Fleming&Thompson
Foley Mountain[a]	39 21	79 30	1897.72	3 16.0 W	3 30	L. A. Bauer
Grafton	39 22	80 01	1898.56	3 29.0 W	3 40	E. Smith
Martinsburg	39 27	77 58	1900.24	4 36.8 W	4 42	Fleming&Thompson
Keyser	39 27	78 59	1898.59	3 29.4 W	3 40	E. Smith
Kingwood	39 28	79 41	1900.23	3 41.8 W	3 47	Fleming&Thompson
Paw Paw	39 32	78 26	1899.41	4 10.8 W	4 19	L. A. Bauer
Morgantown	39 38	79 57	1900.47	3 31.8 W	3 36	J. A. Fleming
Cameron	39 50	80 34	1864.04	0 24.0 E	2 30	A. T. Mosman
Wheeling	40 04	80 44	1898.55	1 01.3 W	1 13	E. Smith
Group II						
Union	37 36	80 32	1898.8	1 43 W	1 53	E. L. Faison
Dego	38 14	81 23	1895.2	0 34 W	0 57	O. A. Veazey
Edray	38 16	80 06	1872	0 20 E	1 32	County surveyor
Winfield	38 32	81 55	1901.2	1 45.2 W	1 47	J. H. Shank
Near Elk River, Webster Co.	38 35	80 20	1787.5	1 45 E	2 22	Haddon & Jackson
Franklin	38 39	79 20	1901.2	2 42 W	2 44	I. T. Kilo
Near Elk R., Randolph Co.	38 40	80 15	1784.5	1 30 E	2 30	Friend & Hanway
Bull Town	38 48	80 31	1824.0	2 10 E	2 12	—— Boye
Upper Front	38 48	79 18	1883	1 10 W	2 18	County surveyor
Spencer	38 48	81 23	1898.6	1 43 W	1 54	E. L. Faison
Point Pleasant	38 50	82 09	1898.9	1 21 W	1 31	Do.
Calhoun County	.. ..	.. ..	1892	0 45 W	1 18	County surveyor
Grantsville	38 56	81 06	1898.6	1 15 W	1 26	E. L. Faison
Glenville	38 56	80 50	1898.5	2 08 W	2 19	Do.
Edmiston	38 59	80 35	1885	2 00 W	3 00	County surveyor
Petersburg	39 00	79 07	1898.5	3 37 W	3 48	G. T. Hawkins
Wirt County	.. ..	.. ..	1895	2 45 W	3 07	County surveyor
Elizabeth	39 07	81 26	1898.9	2 28 W	2 38	E. L. Faison
Parsons	39 07	79 41	1898.5	3 22 W	3 33	Do.
Potomac River, N. Branch	39 18	79 19	1824.0	1 35 E	2 47	—— Boye
Pruntytown	39 20	80 05	1883.3	2 33 W	3 42	R. McPheeters
Grafton	39 22	80 01	1898.5	3 38 W	3 49	G. T. Hawkins
St. Marys	39 24	81 14	1898.9	1 04 W	1 14	E. L. Faison
Keyser	39 27	78 59	1898.5	3 57 W	4 08	G. T. Hawkins
Daniels	39 28	79 03	1898.5	3 11.1 W	3 22	W. M. Brown
Fairmont	39 28	80 09	1898.5	3 21 W	3 32	E. L. Faison
Middlebourne	39 30	80 56	1898.9	1 36 W	1 46	Do.
Berkeley Springs	39 36	78 13	1897.9	4 36 W	4 50	W. J. Peters

[a] For other values in the disputed territory along the boundary line see Maryland, Group I

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

WEST VIRGINIA—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*E. or W.* ° ′	*West* ° ′	
Cumberland Gap	39 38	78 44	1824.0	4 35(?)E	. . .	—— Boye
New Martinsville	39 40	80 53	1898.9	0 59 W	1 09	E. L. Faison
2 miles W. of SW. cor. of Pa.	39 43	80 33	1785.4	2 15 E	1 45	A. Ellicott
Moundsville	39 55	80 46	1898.9	1 07 W	1 17	E. L. Faison
Wheeling, Echo Point Park	40 03	80 42	1886.7	0 12 W	1 07	F. L. Hoge
Wellsburg	40 16	80 38	1898.9	1 34 W	1 44	E. L. Faison
New Cumberland	40 31	80 37	1898.9	1 38 W	1 48	Do.

WISCONSIN

Group I	° ′	° ′		*East* ° ′	*East* ° ′	
Milwaukee	43 04	87 53	1888.65	4 22.3	3 18	J. B. Baylor
Madison	43 04	89 25	1900.85	4 53.0	4 47	W. G. Cady
Prairie du Chien	43 04	91 09	1900.84	5 56.6	5 51	Do.
La Crosse	43 50	91 14	1900.83	5 31.8	5 26	Do.
Alma	44 21	91 48	1893.5	6 50.0	6 09	W. R. Hoag
Green Bay	44 30	87 59	1891.60	4 00.9	3 11	J. B. Baylor
Maxvilla	44 32	91 58	1893.6	6 47.7	6 07	W. R. Hoag
Maiden Rock	44 33	92 12	1893.50	6 59.1	6 18	Do.
Ellsworth	44 43	92 29	1893.50	6 51.9	6 11	Do.
Prentice	45 32	90 17	1891.62	4 07.3	3 17	J. B. Baylor
Superior City	46 40	92 04	1880.64	9 45.4	8 03	Do.
Group II						
Kenosha	42 35	87 49	1872.5	5 00	2 43	H. Custer
Kenosha County	.. ..	.. ..	1836	6 02	2 10	Mean, 5 stations
Green County	42 36	89 38	1901.2	4 00	3 56	D. H. Morgan
Do.	.. ..	.. ..	1834	8 27	4 35	Mean, 9 stations
Walworth County	.. ..	.. ..	1835	6 34	2 42	Mean, 16 stations
Rock County	.. ..	.. ..	1834	8 02	4 10	Mean, 21 stations
Janesville	42 41	89 02	1892	4 57	4 11	County surveyor
Lafayette County, average	.. ..	.. ..	1901.5	5 00	4 58	G. A. Marshall
Lafayette County	42 42	89 52	1901.4	4 55	4 52	Do.
Racine County	42 43	88 07	1896.4	2 00	1 33	T. F. Bayley
Racine	42 44	87 48	1872.5	4 29	2 12	H. Custer
Racine County	.. ..	.. ..	1836	6 10	2 18	Mean, 5 stations
Milton, college	42 47	88 55	1900.7	4 20	4 14	Albert Whitford
Mount Pleasant	.. ..	.. ..	1894	4 45	4 09	County surveyor
Mineral Point	42 51	90 10	1839.8	8 40	4 51	J. Locke
Grant County	.. ..	.. ..	1837	8 53	5 03	Mean, 24 stations
Parish	42 58	90 10	1839.8	8 55	5 06	J. Locke
Oakland	42 58	88 56	1885	5 20	4 01	County surveyor
Jefferson County	.. ..	.. ..	1836	6 50	2 59	Mean, 16 stations
Trout Brook	42 59	90 45	1839.8	9 00	5 11	J. Locks
Iowa County	.. ..	.. ..	1836	8 25	4 34	Mean, 27 stations
Waukesha County, average	.. ..	.. ..	1889.5	3 52	2 52	County surveyors
Campbell	43 01	89 26	1839.8	8 38.7	4 50	J. Locke
Bluemounds	43 01	89 46	1839.8	8 38	4 49	Do.
Fort Crawford	43 03	90 52	1823.5	8 49	4 58	S. H. Long
Dane County, average	.. ..	.. ..	1896.9	5 00	4 35	W. L. Marcy
New Lisbon	43 08	88 12	1884.7	4 55.5	3 33	W. Powrie

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

WISCONSIN—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		East ° ′	East ° ′	
Crawford County	.. ..	.. ..	1842	8 03	4 25	Mean, 10 stations
Ozaukee County	.. ..	.. ..	1835	7 00	3 00	1 station
Richland County	.. ..	.. ..	1840	8 36	4 50	Mean, 11 stations
Washington County	.. ..	.. ..	1836	7 28	3 30	Mean, 3 stations
Dodge County	.. ..	.. ..	1835	7 10	3 15	Mean, 21 stations
Logansville	43 26	90 04	1901.2	4 50	4 46	D. B. Hulburt
Sauk County	.. ..	.. ..	1839	8 00	4 11	Mean, 7 stations
Baraboo	43 28	89 45	1893	4 30	3 49	County surveyor
Columbia County	.. ..	.. ..	1836	7 40	3 50	Mean, 9 stations
Portage	43 32	89 26	1895	4 45	4 13	County surveyor
Vernon County	.. ..	.. ..	1894	6 09	5 33	Do.
7 miles south of Sheboygan	43 39	87 44	1870.80	8 23	5 58	J. W. Cuyler
Sheboygan County	.. ..	.. ..	1900.4	3 15	3 07	L. Bode
Do.	.. ..	.. ..	1835	7 02	3 10	Mean, 16 stations
Sheboygan	43 45	87 42	1894	3 20	2 44	County surveyor
Mauston	43 46	90 04	1900.5	4 53	4 45	Gov't survey
Fond du Lac County	.. ..	.. ..	1835	6 53	3 01	Mean, 20 stations
Green Lake County	.. ..	.. ..	1834	7 50	3 58	Mean, 10 stations
Monroe County	.. ..	.. ..	1895	6 32	6 00	County surveyor
New Holstein	43 57	88 05	1895	4 40	4 08	Do.
Calumet County	.. ..	.. ..	1837	6 35	2 44	Mean, 11 stations
2 miles south of Manitowoc	44 04	87 39	1870.6	5 03	2 38	J. P. Mayer
Winnebago County	.. ..	.. ..	1836	6 40	2 49	Mean, 17 stations
Winneconne	44 07	88 43	1874	7 28	5 19	County surveyor
Waushara County	.. ..	.. ..	1835	6 50	2 58	1 station
Manitowoc County	.. ..	.. ..	1835	6 30	2 38	Mean, 10 stations
Roley Point	44 11	87 31	1866.8	6 56	4 16	H. Gillman
Trempealeau County	.. ..	.. ..	1896	6 30	6 03	County surveyor
Jackson County, average	.. ..	.. ..	1900.5	4 49	4 42	C. M. Keach
Appleton	44 16	88 23	1895	3 35	3 03	County surveyor
Outagamie County	.. ..	.. ..	1839	6 13	2 24	Mean, 21 stations
Portage County	44 25	89 35	1885.5	5 43	4 24	F. E. Halladay
Wood County	.. ..	.. ..	1840	8 13	4 25	Mean, 4 stations
Waupaca County	.. ..	.. ..	1844	6 15	2 34	Mean, 3 stations
Do.	.. ..	.. ..	1901.2	3 45	3 41	S. P. Guthu
Brown County	.. ..	.. ..	1839	6 27	2 38	Mean, 26 stations
Portage County	.. ..	.. ..	1840	8 06	4 18	Mean, 7 stations
Kewaunee	44 28	87 30	1901.2	2 36	2 28	W. T. Rooney
Kewaunee County	.. ..	.. ..	1840	6 10	2 22	Mean, 3 stations
Green Bay, near Ft. Howard	44 31	87 54	1884.5	4 26	3 02	C. S. Woodard
Neillsville	44 32	90 35	1891	5 28	4 37	County surveyor
2½ miles south of Sable Pt.	44 32	87 56	1843.5	6 26	2 43	J. H. Simpson
Head of Green Bay	44 33	87 59	1865.6	5 25	2 41	O. N. Chaffee
Ahnepee	44 36	87 26	1866.6	5 33	2 53	H. Gillman
Long Tail Point Light	44 36	87 54	1845.5	6 25	2 45	Chart
Arkansaw	44 38	92 01	1895	6 00	5 28	County surveyor
1 mile north of Clay Banks	44 42	87 21	1866.6	6 18	3 38	H. Gillman
Near Red River	44 43	87 43	1865.8	6 08	3 25	A. C. Lamson
1 m. north of Sugar Creek	44 48	87 39	1843.5	6 09	2 26	J. H. Simpson
Eau Claire	44 48	91 28	1894	6 25	5 49	County surveyor
Shawano County	.. ..	.. ..	1841	5 55	2 08	Mean, 3 stations
Door County	.. ..	.. ..	1836	6 20	2 29	Mean, 48 stations
Do.	.. ..	.. ..	1901.2	2 30	2 26	C. M. Whiteside
Little Sturgeon Bay	44 51	87 33	1865.7	6 16	3 33	A. C. Lamson
Whitefish Point	44 52	87 12	1866.5	5 49	3 08	O. N. Chaffee

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

WISCONSIN—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Marathon County	.. ..	.. ..	1840	7 44	3 56	Mean, 8 stations
Oconto	44 53	87 50	1865.6	5 21	2 37	A. F. Chaffee
Whitefish Bay	44 54	87 12	1866.5	5 49	3 08	H. Gillman
Sturgeon Bay, north side	44 54	87 24	1865.5	4 36	1 52	A. C. Lamson
4 m. north of Sturgeon Bay	44 58	87 22	1843.5	4 59	1 16	J. H. Simpson
Peshtigo	44 59	87 38	1865.6	4 20	1 36	A. F. Chaffee
Oconto County, average	.. ..	.. ..	1900.5	2 30	2 22	E. Fitzgerald
Egg Harbor	45 03	87 16	1865.6	4 49	2 05	H. C. Penny
Green Island	45 03	87 30	1863.8	4 32	1 42	D. F. Henry
Bayleys Harbor L. H.	45 04	87 05	1863.8	4 26	1 36	J. R. Mayer
New Richmond	45 06	92 30	1900.4	4 50	4 42	John McClure
Ephraim	45 09	87 10	1863.6	4 42	1 51	H. Gillman
Chambers Island	45 10	87 20	1864.6	3 48	1 01	A. Molitor
Rawley Bay	45 12	87 03	1863.7	4 22	1 31	J. R. Mayer
Chippewa County	.. ..	.. ..	1895	5 47	5 15	County surveyor
Hedgehog Harbor	45 17	87 02	1863.6	4 38	1 47	H. Gillman
Detroit Island	45 19	86 55	1862.8	4 14	1 20	J. R. Mayer
Washington Harbor	45 24	86 56	1863.7	3 38	0 47	S. W. Robinson
Washington Island	45 25	86 56	1865.5	3 30	0 46	
Marinette County	.. ..	.. ..	1837	6 46	2 55	Mean, 18 stations
Price County	.. ..	.. ..	1886	5 26	4 12	1 sta. by Co. surv'r
Oneida County	.. ..	.. ..	1895	3 45	3 13	County surveyor
Tomahawk Lake	45 47	89 36	1900.4	3 27	3 19	D. H. Vaughn
Sawyer County	.. ..	.. ..	1895	6 00	5 28	County surveyor
Florence	45 55	88 14	1896	4 21	3 54	Do.
Vilas County	46 06	89 38	1900.5	3 33	3 25	D. H. Vaughn
Oronto River	46 34	90 26	1868.6	6 58	4 25	H. Gillman
Bay City	46 35	90 52	1869.5	8 10	5 40	A. C. Lamson
Bad River	46 38	90 39	1869.5	7 30	5 00	Do.
Chequamegon Point	46 41	90 45	1869.5	7 36	5 06	Do.
Point on Shore	46 42	91 50	1824.5	12 20	8 28	H. W. Bayfield
5½ m. E. of Aminicon River	46 43	91 45	1861.6	10 17	7 19	H. C. Penny
Madeline Island, S. point	46 45	90 47	1824.5	9 48	5 56	H. W. Bayfield
Point on Shore	46 48	91 30	1824.5	12 27	8 35	Do.
Madeline Island, N. point	46 50	90 35	1869.5	7 08	4 38	A. C. Lamson
Madeline Island, N. side	46 50	90 40	1869.5	7 38	5 08	Do.
Little I., NE. Michigan I.	46 54	90 26	1869.5	6 21	3 51	A. F. Chaffee
Presque Isle	46 55	90 37	1901.7	4 34	4 32	F. G. Ray

WYOMING

Group I	° ′	° ′		*East* ° ′	*East* ° ′	
Cheyenne	41 08	104 49	1878.70	15 11.4	14 24	J. B. Baylor
Sherman	41 08	105 24	1872.58	15 52.6	15 01	W. Suess
Laramie	41 19	105 36	1878.73	15 07.4	14 20	J. B. Baylor
Carter	41 26	110 26	1878.78	17 06.3	16 27	Do.
Green River	41 32	109 29	1878.77	16 46.2	16 07	Do.
Point of Rocks	41 43	108 58	1878.76	16 17.8	15 40	Do.
Fort F. Steele	41 47	106 57	1878.74	16 10.1	15 30	Do.
Creston	41 48	107 45	1878.75	16 03.8	15 20	Do.

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

WYOMING—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group I—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Rock Creek	41 50	105 51	1878.73	15 45.8	15 00	J. B. Baylor.
Yellowstone Lake	44 33	110 24	1892.47	18 50.3	18 30	G. R. Putnam
NE. corner of Wyoming	45 00	104 03	1882.45	15 39.0	14 48	B. A. Colonna
Little Missouri River	45 00	104 25	1882.48	16 11.2	15 20	Do.
Mile post 42	45 00	110 12	1882.63	19 31.2	18 56	Do.
Mile posts 283, 284	45 00	105 20	1882.51	16 54.9	16 10	Do.
Mile post 185	45 00	107 21	1882.54	17 57.4	17 20	Do.
Group II						
Southern Boundary	41 00	104 15	1873.4	13 44	12 40	A. V. Richards
Do.	41 00	104 38	1873.4	14 14	13 12	Do.
Do.	41 00	105 01	1873.5	15 06	14 06	Do.
Do.	41 00	105 24	1873.5	15 28	14 30	Do.
Do.	41 00	105 47	1873.5	15 53	14 57	Do.
Do.	41 00	106 10	1873.5	15 46	14 52	Do.
Do.	41 00	106 33	1873.6	15 42	14 50	Do.
Do.	41 00	106 56	1873.6	15 43	14 53	Do.
Do.	41 00	107 19	1873.6	16 05	15 17	Do.
Do.	41 00	107 42	1873.6	16 05	15 19	Do.
Do.	41 00	108 05	1873.6	15 56	15 12	Do.
Do.	41 00	108 28	1873.6	15 47	15 05	Do.
Do.	41 00	108 50	1873.6	15 46	15 06	Do.
Do.	41 00	109 13	1873.6	16 08	15 32	Do.
Do.	41 00	109 36	1873.7	16 15	15 39	Do.
Do.	41 00	109 59	1873.7	16 16	15 42	Do.
Do.	41 00	110 22	1873.7	16 23	15 51	Do.
Do.	41 00	110 50	1873.7	16 40	16 10	Do.
Cheyenne	41 07	104 49	1901.3	14 23	14 21	W. D. Pease
Western Boundary	41 11	111 03	1874.4	17 24	16 54	A. V. Richards
Evanston	41 15	110 58	1892	16 35	16 19	County surveyor
Fort Sanders	41 17	105 35	1873.5	15 30	14 33	G. M. Wheeler
Laramie	41 19	105 36	1895	14 24	14 08	County surveyor
Fort Bridger	41 20	110 24	1858.9	19 37	19 07	J. H. Simpson
Sweetwater County, SE.	.. ..	... ..	1881	15 48	15 12	Mean, 9 stations
Sweetwater County, SW.	.. ..	... ..	1880	15 45	15 08	Mean, 14 stations
Albany County, south	.. ..	... ..	1880	15 35	14 50	Mean, 6 stations
Carbon County, southeast	.. ..	... ..	1884	16 02	15 25	Mean, 14 stations
Carbon County, southwest	.. ..	... ..	1881	15 48	15 08	Mean, 16 stations
Laramie County, southeast	.. ..	... ..	1882	15 06	14 20	Mean, 3 stations
Laramie County, southwest	.. ..	... ..	1878	15 20	14 30	Mean, 2 stations
Uinta County, south	.. ..	... ..	1880	17 00	16 30	Mean, 14 stations
Western Boundary	41 33	111 03	1874.4	17 34	17 04	A. V. Richards
Chugwater Creek	41 45	104 50	1877.5	12 18.4	11 25	W. S. Stanton
Bear River	41 54	111 00	1877.5	18 13	17 40	S. E. Tillman
Western Boundary	41 54	111 03	1874.4	17 57	17 27	A. V. Richards
Sweetwater County, NE.	.. ..	... ..	1882	16 28	15 53	Mean, 30 stations
Sweetwater County, NW.	.. ..	... ..	1885	16 45	16 14	Mean, 14 stations
Albany County, north	.. ..	... ..	1878	15 50	15 03	Mean, 12 stations
Carbon County, northeast	.. ..	... ..	1881	16 27	15 47	Mean, 11 stations
Carbon County, northwest	.. ..	... ..	1881	16 30	15 50	Mean, 16 stations
Chugsprings	41 59	104 51	1877.5	15 26.3	14 30	W. S. Stanton
Laramie County, northeast	.. ..	... ..	1878	15 30	14 35	Mean, 18 stations
Laramie County, northwest	.. ..	... ..	1878	15 28	14 35	Mean, 13 stations

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

WYOMING—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Fort Laramie	42 12	104 34	1877.7	15 24.8	14 28	W. S. Stanton
Laramie Peak, SE. Base	42 15	105 23	1877.7	16 42.5	15 50	Do.
Little Sandy Creek	42 15	109 40	1858.8	20 44	20 08	J. H. Simpson
Western Boundary	42 16	111 03	1874.5	18 14	17 44	A. V. Richards
Sweetwater River	42 30	108 35	1858.8	19 56	19 20	J. H. Simpson
Camp Aspen Hut	42 30	108 58	1858.5	16 42	16 06	W. H. Wagner
Piney Canyon, mouth	42 32	109 58	1858.6	17 53	17 17	Do.
La Bonte Creek	42 35	105 22	1858.8	18 23	17 30	J. H. Simpson
Uinta County, middle	.. ..	... ..	1887	17 36	17 12	Mean, 41 stations
Western Boundary	42 38	111 03	1874.5	18 20	17 50	A. V. Richards
Sweetwater River	42 38	107 25	1858.8	19 41	18 52	J. H. Simpson
Greasewood Creek	42 40	107 07	1858.8	20 24	19 34	Do.
Fremont County, southeast	.. ..	... ..	1882	16 43	16 05	Mean, 17 stations
Fremont County, southwest	.. ..	... ..	1891	17 07	16 45	Mean, 18 stations
Natrona County, southeast	.. ..	... ..	1882	16 30	15 48	Mean, 13 stations
Natrona County, southwest	.. ..	... ..	1883	16 46	16 06	Mean, 18 stations
Converse County, southwest	.. ..	... ..	1882	15 43	15 00	Mean, 19 stations
Converse County, southeast	.. ..	... ..	1879	15 40	14 50	Mean, 17 stations
West of Deer Creek	42 53	105 57	1858.8	18 28	17 35	J. H. Simpson
Western Boundary	42 59	111 03	1874.5	18 28	17 58	A. V. Richards
Popo Agie River	43 00	108 28	1860.5	15 12	14 32	
Bad Water River	43 08	107 53	1860.5	16 00	15 15	
Converse County, northeast	.. ..	... ..	1881	15 04	14 15	Mean, 24 stations
Converse County, northwest	.. ..	... ..	1881	15 55	15 10	Mean, 28 stations
Natrona County, northeast	.. ..	... ..	1881	16 38	15 54	Mean, 23 stations
Natrona County, northwest	.. ..	... ..	1883	18 12	17 28	Mean, 17 stations
Fremont County, northeast	.. ..	... ..	1890	16 50	16 24	Mean, 35 stations
Fremont County, northwest	.. ..	... ..	1892	17 52	17 32	Mean, 22 stations
Lance Creek	43 19	104 20	1877.6	15 14.1	14 18	W. S. Stanton
Deer Creek	43 19	105 52	1859.5	16 23	15 29	
Western Boundary	43 21	111 03	1874.5	18 31	18 01	A. V. Richards
Wind River	43 32	110 00	1860.5	19 30	18 54	
Snake River	43 32	110 49	1872.8	17 40	17 05	F. V. Hayden
South Cheyenne River	43 33	104 09	1877.6	15 40.4	14 44	W. S. Stanton
Pass no Pass	43 33	110 23	1860.5	20 45	20 10	
Powder River	43 38	106 33	1859.5	16 32	15 38	
A small brook	43 39	105 52	1877.6	16 43.3	15 55	W. S. Stanton
Camp 44	43 40	110 43	1872.7	17 38	17 05	F. V. Hayden
Uinta County, north	.. ..	... ..	1882	17 40	17 10	Mean, 17 stations
Western Boundary	43 43	111 03	1874.6	18 30	18 00	A. V. Richards
Teton Canyon	43 46	111 00	1872.6	17 55	17 24	F. V. Hayden
Fort McKinney	43 47	106 15	1877.7	17 00.8	16 13	W. S. Stanton
Tetons, east foot	43 47	110 43	1872.7	17 42	17 10	F. V. Hayden
Johnson County, SE.	.. ..	... ..	1881	16 34	15 50	Mean, 19 stations
Johnson County, SW.	.. ..	... ..	1881	17 18	16 34	Mean, 16 stations
A swale	43 51	105 37	1877.6	16 19.8	15 30	W. S. Stanton
Weston County	43 52	104 12	1899	16 16	16 09	F. W. Coates
Weston County, east	.. ..	... ..	1881	15 05	14 15	Mean, 23 stations
Weston County west	.. ..	... ..	1881	15 55	15 08	Mean, 34 stations
Camp 42, foot of Jackson L.	43 52	110 41	1872.7	17 56	17 24	F. V. Hayden
Beaver Creek Valley	43 53	104 06	1877.6	15 52.0	14 56	W. S. Stanton
Bighorn County, SE.	.. ..	... ..	1884	18 50	18 15	Mean, 44 stations
Western Boundary	44 04	111 03	1874.6	18 36	18 06	A. V. Richards
Lewis Fork, mouth	44 08	110 40	1872.7	18 08	17 36	F. V. Hayden

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

WYOMING—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Beula Lake	44 09	110 44	1872.7	18 55	18 23	F. V. Hayden
Belle Fourche River	44 11	105 05	1877.6	16 08.8	15 16	W. S. Stanton
Fall River, Bechler Fork	44 11	110 58	1872.6	18 15	17 45	F. V. Hayden
Bighorn County, SW.	.. ..	... ..	1883	19 56	19 23	Mean, 8 stations
Lewis Fork, near Lewis L.	44 14	110 33	1872.7	18 13	17 40	F. V. Hayden
Shoshone Lake	44 21	110 40	1872.7	18 15	17 43	Do.
Johnson County, NE.	.. ..	... ..	1882	16 10	15 28	Mean, 19 stations
Johnson County, NW.	.. ..	... ..	1880	15 50	15 08	Mean, 13 stations
Sundance	44 25	104 24	1889	15 45	15 10	County surveyor
Western Boundary	44 26	111 03	1874.6	18 58	18 28	A. V. Richards
Gilliss Creek	44 27	104 36	1877.6	16 11.5	15 16	W. S. Stanton
Upper Geyser Basin	44 28	110 30	1872.6	18 29	17 56	F. V. Hayden
Redwater Creek	44 32	104 06	1877.6	15 40.0	14 44	W. S. Stanton
Lower Geyser Basin	44 34	110 30	1872.6	18 29	17 56	F. V. Hayden
Crook County, east	.. ..	... ..	1882	16 10	15 22	Mean, 26 stations
Crook County, west	.. ..	... ..	1882	16 55	16 10	Mean, 44 stations
Bighorn County, NE.	.. ..	... ..	1883	19 13	18 37	Mean, 28 stations
Bighorn County, NW.	.. ..	... ..	1882	20 07	19 32	Mean, 11 stations
Yellowstone Falls	44 44	110 34	1872.6	19 00	18 27	F. V. Hayden
Western Boundary	44 48	111 03	1874.6	19 20	18 50	A. V. Richards
Sheridan County, east	.. ..	.. ..	1882	16 50	16 08	Mean, 25 stations
Sheridan County, west	.. ..	... ..	1870	17 00	16 12	Mean, 2 stations
Tongue River	44 53	107 14	1859.5	16 30	15 44	J. Mullan
Hot Springs	44 58	110 43	1872.6	19 17	18 45	F. V. Hayden

BERMUDAS, WEST INDIA ISLANDS, CENTRAL AMERICA, AND MEXICO TO LONGITUDE 100° WEST OF GREENWICH

Group I	° ′	° ′		(*E or W*) ° ′	(*E or W*) ° ′	
Port Escondido	16 04	96 57	1880.88	7 41.7 E	6 36 E	H. E. Nichols
Salina Cruz	16 10	95 27	1880.87	7 17.2 E	6 11 E	Do.
Acapulco	16 49	99 56	1880.90	7 56.6 E	6 53 E	Do.
Belize	17 29	88 12	1879.29	5 47.2 E	4 40 E	S. M. Ackley
Coatzacoalcos	18 08	94 26	1880.14	7 10.5 E	6 02 E	Do.
Laguna de Terminos	18 38	93 00	1880.17	6 39.9 E	5 31 E	Do.
Vera Cruz	19 12	96 08	1880.11	7 26.3 E	6 17 E	Do.
City of Mexico	19 26	99 07	1884.29	8 13.9 E	7 33 E	G. Davidson
Campeche	19 50	90 33	1880.19	6 36.7 E	5 30 E	S. M. Ackley
Cozumel Island	20 33	86 57	1879.32	5 12.3 E	4 03 E	Do.
Mugeres Island	21 15	86 46	1879.32	4 49.3 E	3 40 E	Do.
Progresso	21 17	89 40	1880.20	6 25.7 E	5 17 E	Do.
Cape San Antonio	21 56	84 55	1879.27	4 44.0 E	3 35 E	Do.
Arenas Cay	22 07	91 25	1880.08	6 32.9 E	5 24 E	Do.
Perez Island	22 24	89 42	1880.06	6 19.2 E	5 10 E	Do.
Bahia Honda	22 58	83 12	1879.24	4 03.4 E	2 54 E	Do.
Matanzas	23 03	81 37	1879.18	3 26.4 E	2 17 E	Do.
Habana	23 08	82 22	1879.20	3 53.8 E	2 45 E	Do.
Water Cay	23 59	80 21	1879.16	2 50.7 E	1 42 E	Do.
Nassau	25 06	77 20	1879.14	1 25.6 E	0 35 E	Do.
South Bemini	25 42	79 18	1879.15	2 27.9 E	1 28 E	Do.
Nonsuch Island	32 21	64 39	1890.40	8 04 E	8 16 W	E. D. Preston

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

BERMUDAS, WEST INDIA ISLANDS, CENTRAL AMERICA, AND MEXICO TO LONGITUDE 100° WEST OF GREENWICH—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II	° ′	° ′		(*E or W*) ° ′	(*E or W*) ° ′	
Ile Flamenco, Panama Bay	8 55	79 31	1891.4	5 01.0 E	4 29 E	M. L. Courmes
Panama	8 57	79 26	1883.1	5 02 E	4 08 E	Lieut. Bernardiere
Chagres	9 19	79 58	1832.5	6 28 E	3 35 E	—— Foster
Colon	9 22	79 54	1891.7	7 22.0 E	6 53 E	M. L. Courmes
Cartagena	10 25	75 35	1837.5	5 41 E	3 00 E	—— Milne
Puerto Cabello	10 30	68 00	1887.0	2 39 E	2 12 E	M. Aubry
La Guayra	10 36	66 57	1891.7	3 02.0 E	1 51 E	M. L. Courmes
Trinidad	10 39	61 30	1891.7.	0 10.0 E	0 02 E	Do.
Carupano	10 42	63 14	1891.7	0 56.0 E	0 48 E	Do.
Nicaragua	10 56	83 42	1839.5	7 00 E	4 18 E	E. Barnett
Barranquilla	10 59	75 06	1857.5	5 24 E	3 34 E	—— Friesach
Sabanilla	11 00	74 57	1891.7	4 13.0 E	3 49 E	M. L. Courmes
Santa Marta	11 16	74 14	1887.1	3 47.1 E	3 20 E	M. Aubry
Curaçao	12 06	68 56	1890.1	2 28 E	2 07 E	L. M. Garrett
Corinto	12 28	87 12	1898.1	3 50 E	5 38 E	H. M. S. Amphion
Barbados	13 05	59 36	1900.3	2 00 W	2 02 W	H. M. S. Indefatigable
Guatemala	14 35	90 30	1857.6	7 17 E	5 00 E	Jesuit fathers
Fort de France	14 36	60 56	1887.3	0 17.3 W	0 25 W	M. Aubry
Dominica	15 18	64 33	1826.5	1 15 E	. ..	—— Zahrtmann
Beacon Key	15 48	79 51	1844.5	6 00 E	3 30 E	—— Lawrence
Des Saintes	15 52	61 34	1888.5	1 05.5 W	1 16 W	Leconte de Roujon
Basse Terre	16 00	61 44	1888.2	0 27.5 W	0 39 W	M. Aubry
South Key, Honduras Bay	16 03	86 59	1844.5	7 45 E	5 02 E	—— Lawrence
The Hobbies	16 04	83 11	1833.5	6 00 E	3 00 E	E. Barnett
Salina Cruz	16 10	95 12	1889.2	6 59 E	6 20 E	Laird, Norris, Holcombe
Pointe à Pitre	16 13	61 32	1888.5	0 50 W	1 01 W	Leconte de Roujon
Acapulco	16 51	99 56	1898.0	7 32.9 E	7 21 E	H. M. S. Egeria
Antigua	17 08	61 52	1848.5	0 46 E	0 54 W	E. Barnett
St. Croix	17 45	64 44	1853.5	1 32 E	0 02 W	—— Lang
Point Moran, Jamaica	17 55	76 16	1831.5	5 13 E	2 16 E	—— Austin
Port Royal	17 56	76 51	1896.6	2 49 E	2 38 E	H. M. S. Magicienne
Coatzacoalcos	18 09	94 25	1889.1	6 53 E	6 14 E	Laird, Norris, Holcombe
Anguilla Island	18 14	63 09	1846.5	0 56 E	0 58 W	E. Barnett
St. Thomas	18 20	64 55	1888.4	0 23 W	0 40 W	Aubry and Roujon
Port au Prince	18 33	72 25	1887.3	1 44 E	1 20 E	M. Aubry
Cocolopam	18 53	97 04	1856.6	8 28 E	6 28 E	A. Sonntag
Potrero	18 56	96 48	1856.6	8 39 E	6 39 E	Do.
San Andres	18 59	97 15	1856.7	8 13 E	6 13 E	Do.
Flamacas	19 03	98 39	1857.1	8 28 E	6 28 E	Do.
Vera Cruz	19 12	96 07	1889.0	7 12.7 E	6 31 E	Laird, Norris, Holcombe
Mirador	19 13	96 37	1856.8	8 02 E	6 02 E	A. Sonntag
Chalco	19 18	98 51	1857.0	9 03 E	7 07 E	Do.
Tacubaya	19 26	99 07	1895.5	7 45.8 E	7 31 E	M. Moreno y Anda
Port Plata	19 49	70 41	1890.0	0 37 E	0 20 E	Laird & Garrett
Cumberland Harbor	19 55	75 15	1837.5	3 31 E	0 48 E	—— Milne
Zacatlan	19 56	97 59	1901.1	7 45.1 E	7 42 E	M. Moreno y Anda
Santiago	20 00	75 51	1887.1	2 33.1 E	2 00 E	M. Aubry
Cape Maysi	20 14	74 12	1831.5	2 27 E	0 30 W	—— Austin

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

BERMUDAS, WEST INDIA ISLANDS, CENTRAL AMERICA, AND MEXICO TO LONGITUDE 100° WEST OF GREENWICH—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		(*E* or *W*) ° ′	(*E* or *W*) ° ′	
Baracoa	20 22	74 34	1831.5	3 17 E	0 20 E	Austin & Foster
San Domingo Key	21 33	75 45	1837.5	4 02 E	1 20 E	——— Milne
Crooked (?) Island	22 07	74 24	1835.5	5 13 E	2 25 E	——— Foster
Crooked Island	22 47	74 21	1837.5	2 34 E	0 10 W	——— Milne
Habana	23 08	82 22	1901.1	3 07.8 E	3 05 E	L. Gangoiti
Watling Island	23 57	74 25	1831.5	2 31 E	0 26 W	——— Smith
Bermuda, Challenger Station	32 19	64 52	1898.0	8 10.0 W	8 14 W	H. M. S. Rambler

MEXICO, WEST OF LONGITUDE 100° WEST OF GREENWICH

Group I	° ′	° ′		*East* ° ′	*East* ° ′	
Isla Grande	17 40	101 41	1880.9	7 26.4	6 20	H. E. Nichols
Clarion Island	18 20	114 42	1880.8	8 23	7 55	Do.
Socorro Island	18 43	110 54	1880.8	8 49.6	8 20	Do.
Manzanilla	19 03	104 20	1880.9	8 05.0	7 05	Do.
San Blas	21 32	105 18	1880.9	9 18.1	8 18	Do.
Cape San Lucas	22 54	109 55	1881.1	9 26.2	8 50	Do.
San José del Cabo	23 04	109 41	1881.1	9 43.8	9 07	Do.
Mazatlan	23 12	106 27	1881.1	9 39.4	8 40	Do.
La Paz	24 10	110 21	1881.1	10 09.2	9 30	Do.
Pichilingue Bay	24 16	110 20	1881.1	9 45.1	9 06	Do.
Magdalena Bay	24 38	112 09	1881.2	10 29.1	9 55	Do.
Isle San Josef	24 55	110 37	1881.1	9 47.6	9 14	Do.
Point San Ignacio	25 36	109 17	1881.0	10 15.3	9 40	Do.
Loreto	26 01	111 20	1881.1	10 16.3	9 43	Do.
Pequeña Bay	26 16	112 28	1881.2	10 31.1	9 55	Do.
Santa Barbara Bay	26 42	109 38	1881.0	10 48.4	10 12	Do.
Point Abreojos	26 47	113 31	1881.2	11 15.5	10 46	Do.
Muleje	26 54	111 58	1881.1	11 13.4	10 40	Do.
Ascension Island	27 06	114 18	1881.2	11 23.0	10 58	Do.
Santa Maria Cove	27 25	112 20	1881.1	11 06.3	10 33	Do.
Guaymas	27 55	110 53	1881.0	11 48.0	11 14	Do.
Cerros Island	28 03	115 11	1881.2	11 58.6	11 12	Do.
Lagoon Head	28 14	114 06	1873.1	11 50.8	11 24	W. Eimbeck
Santa Teresa Bay	28 25	112 52	1881.0	11 42.0	11 12	H. E. Nichols
Guadaloupe Island	28 55	118 15	1881.2	12 54.8	12 30	Do.
Tiburon Island	29 12	112 27	1881.0	11 59.3	11 34	Do.
San Geronimo	29 47	115 48	1881.2	12 42.2	12 17	Do.
San Luis Gonzales	29 51	114 25	1881.0	12 27.3	12 02	Do.
San Martin Island	30 29	116 07	1881.2	12 55.7	12 31	Do.
Point San Felipe	31 02	114 50	1881.0	12 57.2	12 32	Do.
Rocky Point	31 17	113 33	1881.0	13 27.0	13 00	Do.
Philippe Pt., mouth of river	31 46	114 43	1881.0	13 05.7	12 40	Do.
Todos Santos	31 51	116 38	1881.3	12 00.8	11 40	Do.
Group II						
Near Roca Partida	19 06	112 00	1874.2	8 20.9	7 40	Seymour & Young
Near Benedicte Island	19 15	110 49	1874.2	9 05.8	8 25	Do.
Tabo Bay	20 24	105 40	1874.2	8 54.2	7 36	Do.
Peñas Anchorage	20 36	105 16	1874.2	8 49.7	7 30	Do.

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

MEXICO, WEST OF LONGITUDE 100° WEST OF GREENWICH—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Punta Mita	20 46	105 32	1875.3	9 03.8	7 55	Craig & Seymour
Aguascalientes	21 55	102 17	1897.6	8 14.5	8 00	M. Moreno y Anda
Isabel Island	21 56	105 41	1874.1	9 24	8 06	Seymour & Young
San Luis Potosi	22 09	100 55	1900.4	8 40.7	8 36	M. Moreno y Anda
Todos Santos	23 24	110 14	1875.0	9 14.0	8 30	G. C. Reiter
Observation Point	23 33	109 29	1875.0	9 57.5	9 18	Do.
Punta Arena	24 04	109 50	1875.1	10 06.3	9 24	Do.
El Conejo Point	24 21	111 30	1875.0	10 16.2	9 42	Reiter & Craig
Lupono Pt., Espiritu Santo I.	24 24	110 21	1875.1	9 25.7	8 50	Do.
San Juan Nepomuceno	24 43	101 ..	1900.4	9 05.9	9 01	M. Moreno y Anda
Santa Maria Bay	24 45	112 16	1875.0	10 45.3	10 12	J. E. Craig
San Everisto, San Josef's C.	24 52	110 42	1873.8	8 53.0	8 18	Seymour & Young
San Josef Island	25 02	110 43	1875.1	10 04.6	9 30	Craig & Reiter
Playa Colorado	25 12	108 24	1874.1	10 40.5	10 00	Tuttle & Young
Boca Soledad	25 16	112 08	1875.0	11 07.5	10 30	G. C. Reiter
Navachista	25 23	108 49	1874.1	10 20.2	9 37	Tuttle & Young
Saltillo	25 25	101 06	1900.4	8 39.3	8 34	M. Moreno y Anda
San Marcial Point	25 29	111 02	1875.1	10 11.0	9 37	G. C. Reiter
Topolobampo	25 34	109 10	1874.1	10 40.5	10 00	Tuttle & Young
Carmen Island, Salinas Bay	26 00	111 07	1873.9	11 27.7	10 52	Do.
San Juanico Point	26 03	112 40	1875.0	10 49.5	10 15	G. C. Reiter
Agiabampo	26 17	109 18	1874.1	12 01	11 25	Tuttle & Young
San Domingo Point	26 19	112 42	1875.0	10 21.4	9 48	Craig & Seymour
Pulpito Point	26 31	111 27	1875.1	11 33.6	11 00	G. C. Reiter
Abreojos Point (?)	26 42	113 14	1873.5	11 57.4	11 24	Tanner & Young
San Ignacio Point	26 46	113 16	1875.0	12 07.8	11 30	Craig & Seymour
Abreojos Point	26 47	113 32	1890.0	10 58	10 38	C. F. Pond
Ciaris Island	26 59	109 57	1874.1	11 16.2	10 40	Tuttle & Young
Ascension Island	27 06	114 18	1889.9	10 59.2	10 40	C. F. Pond
San Marcos Island	27 10	112 06	1875.1	10 37.8	10 00	Craig & Reiter
Off Lobos Island	27 20	110 38	1874.1	11 30.6	10 55	Tuttle & Young
Santa Rosalia	27 20	112 18	1892.8	10 51	10 32	L. Motlez
San Bartolome Bay	27 39	114 52	1888.4	11 30	11 08	C. F. Pond
San Carlos Point	28 00	112 48	1875.1	11 45.7	11 15	Craig & Reiter
San Pedro Anchorage	28 03	111 16	1874.0	12 24.6	11 50	Tuttle & Young
Cerros I., Morro Rodondo B.	28 04	115 12	1888.3	11 39.4	11 15	C. P. Pond
Lagoon Head, Sebastian Vizcaino Bay	28 15	114 06	1888.0	11 31.0	11 08	Do.
San Beneto Island	28 18	115 35	1889.1	11 26.6	11 05	Do.
Rosalia Bay, Sebastian Vizcaino Bay	28 40	114 14	1888.2	9 26.3	9 06	Do.
Kino Bay	28 46	111 59	1874.0	12 32.9	12 00	Tuttle & Young
Tiburon Island	28 46	112 22	1874.0	12 28.2	12 00	Do.
Las Animas	28 48	113 13	1873.9	12 35.6	12 00	Do.
Raza Island	28 49	113 00	1875.2	12 30.0	11 55	Reiter & Craig
La Playa, Maria Bay	28 56	114 32	1889.4	10 21.4	10 00	C. F. Pond
Angeles Bay	28 57	113 35	1873.9	12 41.4	12 05	Tuttle & Young
Angel de la Gardia Island	29 00	113 12	1875.1	12 28.8	11 55	Craig & Reiter
Remedios Bay	29 14	113 40	1873.9	12 33.4	12 00	Tuttle & Young
Patos Island	29 16	112 29	1874.0	13 00.2	12 25	Do.
Angel de la Gardia Island	29 32	113 30	1875.2	12 31.9	12 00	G. C. Reiter
Mejia Island	29 33	113 35	1875.2	12 04.5	11 36	Reiter & Seymour
Presidio del Norte	29 34	104 25	1852.5	10 16	9 25	W. H. Emory
San Geronimo Island	29 47	115 48	1888.4	12 23.6	12 00	C. F. Pond
Libertad Bay	29 54	112 45	1874.0	12 56	12 20	Tuttle & Young

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

MEXICO, WEST OF LONGITUDE 100° WEST OF GREENWICH—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
San Luis Island	29 58	114 26	1874.0	12 30.1	12 00	Tuttle & Young
Sepoca Bay	30 16	112 53	1875.2	12 16.7	11 45	G. C. Reiter
San Quentin	30 22	115 59	1873.7	12 59.7	12 35	Tanner & Young
San Firmin	30 25	114 40	1874.0	11 14	10 45	Tuttle & Young
San Martin Island	30 29	116 06	1888.4	12 23.2	12 05	C. F. Pond
Cape Colnet	30 58	116 17	1889.4	13 14.9	12 57	Do.
George's Island	31 01	113 16	1875.2	12 43.5	12 10	Reiter & Seymour
Espia	31 21	107 56	1855.2	12 05	11 20	W. H. Emory
Adair Bay	31 30	114 08	1874.0	13 19.7	12 55	Tuttle & Young
Santo Tomas Anchorage	31 33	116 41	1889.4	13 46.2	13 26	C. F. Pond
El Paso del Norte, Initial Pt.	31 47	106 28	1855.0	11 55	11 26	W. H. Emory
Mouth of Rio Colorado	31 51	114 45	1841.5	11 15	11 25	Duflot de Mofras
Ensinado Anchorage, Bay of Todos Santos	31 51	116 38	1873.6	12 41.2	12 20	Tanner & Young
Los Coronados Islands	32 25	117 15	1889.4	13 09.4	13 00	C. F. Pond

BRITISH POSSESSIONS TO LONGITUDE 75° WEST OF GREENWICH

Group I	° ′	° ′		*West* ° ′	*West* ° ′	
Yarmouth, Nova Scotia	43 50	66 07	1881.85	17 49.4	18 00	S. W. Very
Weymouth, Nova Scotia	44 24	66 00	1881.86	18 43.4	18 54	Do.
Halifax, Nova Scotia	44 40	63 35	1896.52	20 38.5	20 36	G. R. Putnam
Annapolis, Nova Scotia	44 44	65 31	1881.87	19 26.8	19 36	S. W. Very
Windsor, Nova Scotia	45 00	64 08	1881.89	20 42.3	20 54	Do.
Chamcook, New Brunswick	45 08	67 05	1859.79	17 35.7	18 48	G. W. Dean
Arichat, Isle Madame	45 30	61 01	1881.82	23 25.9	22 50	S. W. Very
Montreal	45 30	73 35	1896.79	14 19.0	14 39	R. L. Faris
Sydney, Cape Breton	46 09	60 12	1896.53	24 53.6	24 40	G. R. Putnam
St. Pierre de Miquelon	46 47	56 11	1881.78	28 20.8	27 05	S. W. Very
Quebec	46 48	71 14	1879.72	17 13.7	17 30	J. B. Baylor
St. Johns, Newfoundland	47 34	52 42	1881.74	30 37.3	29 10	S. W. Very
Twillingate, Newfoundland	49 39	54 46	1881.53	33 59.2	32 40	Do.
Group II						
Cape Sable	43 20	65 30	1828.5	12 00	.. ..	Chart
Negro Harbor	43 33	65 25	1859.5	17 20	18 18	P. F. Shortland
Shelburne Light	43 37	65 16	1859.5	17 47	18 45	Do.
Chester Harbor	44 36	64 10	1775.5	13 30	.. ..	J. F. W. Des Barres
Halifax	44 40	63 35	1895.7	21 14.0	21 12	H. M. S. Rambler
Lawrencetown	44 42	63 22	1881.5	21 15	21 20	W. B. Dawson
Waverly	44 47	63 36	1881.8	21 01	21 06	Do.
Barnhart Island	45 00	74 48	1871.5	10 22	13 05	A. C. Lamson
Cornwall Canal	45 00	74 55	1869.5	9 30	12 25	
Stanstead	45 02	72 10	1845.5	11 33	14 50	Boundary survey
Black Rock, near Light	45 10	64 46	1856.5	18 44	19 55	P. F. Shortland
Mispeck Point	45 12	66 00	1859.5	18 16	19 28	Do.
St. John, New Brunswick	45 14	66 03	1866.3	19 22.9	20 11	J. H. Orlebar
Prospect Hill and Conn. R.	45 15	71 14	1845.5	12 08.5	15 10	Boundary survey
Highland Boundary	45 18	71 05	1845.5	13 20	16 22	Do.
St. Johns, near Montreal	45 19	73 00	1842.5	11 22	14 52	J. H. Lefroy
Arnold River	45 20	70 55	1845.5	13 30	16 32	Boundary survey

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

BRITISH POSSESSIONS TO LONGITUDE 75° WEST OF GREENWICH—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*West* ° ′	*West* ° ′	
Dead River	45 26	70 48	1845.5	13 10	16 12	Boundary survey
Highland Boundary	45 31	70 43	1845.5	13 25	16 27	Do.
Isle Madame	45 35	60 56	1848.5	22 30	22 50	G. W. Keely
Rivière à la Graisse	45 36	74 22	1843.5	8 26	14 04	J. H. Lefroy
Carillon	45 36	74 32	1843.5	8 41	14 19	Do.
Highland Boundary	45 37	70 37	1845.5	13 37	16 40	Boundary survey
Pointe aux Chênes	45 37	74 55	1843.5	7 28	13 06	J. H. Lefroy
Merigornish Harbor	45 38	62 27	1842.5	20 15	21 34	H. W. Bayfield
Richmond	45 41	72 03	1876.6	16 59.6	17 50	F. E. Hilgard
Picton Harbor	45 42	62 40	1841.5	20 19	21 38	H. W. Bayfield
Highland Boundary	45 42	70 28	1844.5	13 50	17 05	Boundary survey
Wallace Harbor	45 49	63 26	1840.5	19 50	21 15	H. W. Bayfield
Pugwash Harbor	45 53	63 41	1840.5	19 40	21 05	Do.
Drummondville	45 53	72 34	1842.5	12 28	17 30	J. H. Lefroy
Sorel	46 03	73 00	1842.5	11 22	16 22	Do.
Stone Island	46 06	73 02	1830.5	10 30	16 36	H. W. Bayfield
Isle de Grâce	46 06	73 07	1830.5	10 27	16 33	Do.
Sydney	46 09	60 12	1900.6	24 33.3	24 30	H. M. S. Indefatigable
Cape Tormentine	46 10	63 50	1840.5	20 00	21 20	H. W. Bayfield
Georgetown	46 11	62 33	1843.5	21 58	23 05	H. W. Bayfield
Charlottetown	46 14	63 08	1898.4	23 40.0	23 31	Newf'dland surv.
Ice, Lake St. Peter	46 14	72 44	1828.5	11 15	.. ..	J. H. Lefroy
Carleton Head	46 15	63 43	1840.5	20 18	21 43	H. W. Bayfield
Shediac Island	46 15	64 23	1839.5	19 59	21 30	Do.
Cape Breton	46 17	60 23	1857.5	24 40	24 20	J. H. Orlebar
Three Rivers	46 19	72 36	1842.5	11 58	16 30	J. H. Lefroy
River St. Maurice	46 21	72 43	1835.5	11 32	16 52	H. W. Bayfield
Becancour	46 22	71 33	1876.6	15 43.5	16 34	F. E. Hilgard
Bedeque Harbor	46 24	63 48	1841.5	20 12	21 30	H. W. Bayfield
River St. Croix	46 25	70 03	1844.5	15 02	18 05	Boundary survey
Isle Bigot, River Champlain	46 26	72 24	1835.5	12 41.5	18 02	H. W. Bayfield
Cape Turner	46 30	63 20	1845.5	21 41	22 36	Do.
Richmond Bay	46 34	63 43	1845.5	21 00	21 55	Do.
Grondines	46 34	72 24	1835.5	12 27	17 30	Do.
Platon Point	46 40	71 54	1837.5	12 52	17 36	Do.
Richibucto River	46 43	64 49	1839.5	19 50	22 00	Do.
Trepassy	46 44	53 23	1898.5	28 50.0	28 36	Newf'dland surv.
St. Pierre	46 47	56 10	1899.7	27 16	27 09	M. Colson
Cascumpeque	46 48	64 03	1845.5	21 10	22 30	H. W. Bayfield
Quebec	46 48	71 12	1887.7	17 09.8	17 24	M. Aubry
St. Thomas	46 59	70 33	1876.6	17 50.1	18 05	F. E. Hilgard
Pointe Miquelon	47 02	56 18	1899.7	27 16	27 10	M. Colson
Anse de Miquelon	47 05	56 25	1890.7	28 14	27 40	A. Schwerer
Crane Island	47 05	70 32	1831.5	14 28	18 54	H. W. Bayfield
Miramichi, Vin Island	47 06	65 04	1857.4	21 24	21 32	J. H. Orlebar
Stone Pillar	47 12	70 22	1831.5	14 49	19 16	H. W. Bayfield
Amherst Harbor	47 15	61 50	1833.5	22 36	24 30	Do.
Isle aux Coudres	47 25	70 26	1831.5	15 17	19 43	Do.
Bull Island	47 26	53 47	1858.6	30 27	28 50	—— Otter
St. Johns, Newfoundland	47 34	52 41	1896.4	29 45.4	29 17	H. M. S. Cordelia
Duck Island, near Cape Ray	47 34	59 11	1856.5	27 22	26 45	J. H. Orlebar
Bay Roberts	47 35	53 15	1866.7	30 56.0	29 12	Do.
Cape Bay	47 37	59 19	1856.5	27 37	27 00	Do.
Temiscouata Lake	47 38	69 00	1818.5	16 31	.. ..	J. Johnson

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

BRITISH POSSESSIONS TO LONGITUDE 75° WEST OF GREENWICH—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*West* ° ′	*West* ° ′	
Carbonear	47 44	53 14	1866.5	31 02.0	29 18	J. H. Orlebar
Shippigan Harbor	47 45	64 43	1838.5	21 43	23 18	H. W. Bayfield
Bryon Island	47 48	61 26	1835.5	23 30	24 48	Do.
Caraquette Island	47 50	64 53	1838.5	21 30	23 05	Do.
Rivière du Loup, en bas	47 51	69 25	1876.7	20 38.8	20 37	F. E. Hilgard
Rivière du Loup	47 51	69 35	1831.5	17 36	21 06	H. W. Bayfield
Hearts Content	47 52	53 22	1866.6	31 21.0	29 37	J. H. Orlebar
Codroy Island	47 53	59 25	1835.5	25 00	26 18	H. W. Bayfield
Brandy Pot Island	47 53	69 42	1836.5	17 25	20 07	Do.
Cape Anguille	47 55	59 24	1894.5	26 55.0	26 40	Newf'dland surv.
Northeast boundary claimed before 1842	48 00	67 47	1859.5	19 30	20 12	State survey
Hants Harbor	48 01	53 14	1866.5	32 13.0	30 30	J. H. Orlebar
Miscou Harbor	48 01	64 30	1838.5	20 35	22 15	H. W. Bayfield
Paspebiac	48 01	65 35	1838.5	21 21	23 13	Do.
Dalhousie Island	48 04	66 23	1839.5	20 15	22 10	Do.
Old Perlican	48 05	53 00	1866.4	31 42.0	30 00	J. H. Orlebar
Carleton Point	48 05	66 08	1838.5	20 23	22 17	H. W. Bayfield
Tadousac	48 08	69 43	1887.6	19 27.5	19 40	M. Aubry
Point Maquereau	48 12	64 47	1837.5	22 00	23 40	H. W. Bayfield
Rasade Inlet	48 13	69 09	1829.5	17 34	21 10	Do.
Bic Island	48 25	68 49	1830.5	17 29	21 05	Do.
St. Georges Bay, Sand Pt.	48 28	58 29	1893.6	29 23.0	29 00	Newf'dland surv.
King's Cove	48 34	53 18	1866.6	32 37.0	30 54	J. H. Orlebar
Portneuf	48 37	69 07	1831.5	17 36	21 12	H. W. Bayfield
Bonavista	48 39	53 08	1866.4	34 05.5	32 22	J. H. Orlebar
Port au Port	48 39	58 50	1894.7	28 52.0	28 30	Newf'dland surv.
Baie de Gaspé	48 49	64 28	1887.6	25 08	25 00	M. Aubry
Bersimis Point	48 56	68 38	1831.5	18 48	22 24	H. W. Bayfield
Birchy Cove	48 59	58 00	1899.6	30 00	29 53	M. Colson
Petitpas Cove	48 59	57 59	1900.6	29 56.6	29 52	H. M. S. Indefatigable
Anticosti, Heath Pt.	49 05	*61 42	1892.6	28 41.0	28 16	Newf'dland surv.
Cape Chat	49 06	66 46	1830.5	21 27	24 27	H. W. Bayfield
Mont Louis River	49 15	65 45	1828.5	22 00	24 54	Do.
Pointe des Monts	49 19	67 23	1830.5	20 13	23 13	H. W. Bayfield
Port St. Nicholas	49 19	67 48	1830.5	19 57	22 57	Do.
Neddy Harbor	49 32	57 52	1895.7	29 28.0	29 09	Newf'dland surv.
Egg Inlet	49 38	67 11	1832.5	21 35	24 35	H. W. Bayfield
White Bay, Sops Arm	49 46	56 52	1897.7	32 07.0	31 50	Newf'dland surv.
Cape Henry, Anticosti	49 48	64 24	1830.0	24 22	27 05	H. W. Bayfield
White Bay, Jacksons Arm	49 52	56 46	1897.6	32 51.0	32 38	Newf'dland surv.
Cliffy Point	50 13	57 36	1896.8	32 13.0	31 57	Do.
Baie des Sept Iles	50 13	66 25	1887.6	20 13	20 08	M. Aubry
Port Saunders	50 39	57 17	1890.5	31 49.5	31 15	A. Schwerer
Port au Choix	50 42	57 21	1890.4	31 35.3	31 00	Do.
Baie du Gouffre	50 42	56 09	1890.6	33 10,0	32 36	Do.
Point Rich	50 43	57 23	1897.5	33 03.0	32 50	Newf'dland surv.
Bonnie Baie de St. Jean	50 48	57 12	1899.6	31 45.5	31 38	M. Colson
Baie du Cap Rouge	50 54	55 10	1890.6	34 09.8	33 36	A. Schwerer
Baie de Sainte Marguerite	51 00	57 10	1890.6	33 09.7	32 36	Do.
Havre du Croc	51 04	55 48	1890.6	34 13.2	33 40	Do.
Baie aux Outardes	51 21	55 58	1890.6	35 48.5	35 14	Do.
Bradore	51 28	57 15	1891.7	33 53.0	33 22	Newf'dland surv.
Baie du Sacre	51 36	55 40	1890.6	36 07.4	35 33	A. Schwerer

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

BRITISH POSSESSIONS TO LONGITUDE 75° WEST OF GREENWICH—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*West* ° ′	*West* ° ′	
Straits of Belle Isle	51 36	55 59	1898.6	37 01.0	36 50	Newf'dland surv.
Chateau Bay	52 00	55 50	1891.7	35 51.0	35 20	Do.
Hamilton Inlet, Northwest River, Labrador	53 32	60 09	1860.7	39 03	.. ..	J. H. Orlebar
Hamilton Inlet, near Rigolet, Labrador	54 11	58 25	1860.7	41 09	.. ..	Do.
Hamilton Inlet, Cats Islet	54 22	57 54	1860.7	40 39	.. ..	Do.

BRITISH POSSESSIONS BETWEEN LONGITUDES 75° AND 90° WEST OF GREENWICH

Group I	° ′	° ′		*E or W* ° ′	*E or W* ° ′	
Foot of Long Portage	47 55	84 45	1880.62	3 14.0 W	4 48 W	S. W. Very
Fort Michipicoten	47 56	84 51	1880.60	1 20.5 W	2 54 W	Do.
Big Stony Portage	48 14	84 15	1880.57	4 12.1 W	5 46 W	Do.
Sandy Beach	48 18	84 01	1880.57	1 19.3 W	2 53 W	Do.
Fairy Point	48 21	83 44	1880.58	3 22.2 W	4 58 W	Do.
Missinaibi	48 29	83 28	1880.58	2 21.2 W	3 58 W	Do.
Foot of Swampy ground Portage	48 42	83 24	1880.68	0 12.7 W	1 53 W	Do.
Saint Paul Rapids	48 50	83 24	1880.68	4 10.2 W	5 52 W	Do.
Moose River	49 08	83 22	1880.67	4 20.4 W	6 04 W	Do.
Twin Portage	49 12	83 24	1880.59	4 58.1 W	6 44 W	Do.
Albany Rapids	49 22	83 30	1880.67	4 11.0 W	5 59 W	Do.
Kettle Portage	49 47	83 16	1880.60	4 15.1 W	6 05 W	Do.
Storehouse Portage	50 04	83 16	1880.66	4 54.6 W	6 47 W	Do.
Near Cedar Island	50 21	82 42	1880.63	5 14.5 W	7 08 W	Do.
Moose R., nr. Falling Brook	50 36	82 07	1880.61	7 56.9 W	9 50 W	Do.
Long Gravel Bed	50 44	81 48	1880.65	8 01.9 W	9 56 W	Do.
Gypsum Beds	50 50	81 15	1880.65	9 52.9 W	11 50 W	Do.
Moose Factory, Hudson Bay	51 15	80 40	1880.63	15 27.5 W	17 28 W	Do
Group II						
Middle Island	41 41	82 41	1845.5	1 54 E	1 14 W	J. H. Simpson
Pointe Pelée Island	41 49	82 41	1877.4	0 15 E	1 00 W	F. Terry
East Sister Island	41 49	82 51	1845.5	2 18 E	0 50 W	J. H. Simpson
Middle Sister Island	41 51	83 00	1845.5	2 00 E	1 08 W	Do.
Pointe Pelée	41 55	82 31	1877.7	0 25 E	0 50 W	F. M. Towar
Pigeon Bay	41 59	82 33	1877.7	0 10 W	1 25 W	A. C. Lamson
Colchester	42 00	82 58	1877.7	0 31 E	0 44 W	F. M. Towar
Kingsville	42 02	82 45	1877.7	0 30 E	0 45 W	F. Terry
Bois Blanc Island	42 05	83 07	1874.4	0 32 E	0 54 W	A. C. Lamson
Amherstburg	42 07	83 07	1840.5	1 30 E	1 50 W	J. N. Macomb
Pointe aux Pins	42 15	81 52	1845.5	1 04 E	2 10 W	J. H. Simpson
Rondeau Harbor	42 16	81 52	1896.8	2 07.1 W	2 28 W	W. J. Stewart
Rivière aux Puces	42 18	82 47	1869.0	1 13 E	0 37 W	J. F. Gregory
Mouth of Thames River	42 19	82 27	1871.3	0 29 E	1 15 W	A. C. Lamson
Belleisle	42 20	83 00	1873.8	0 35 E	0 51 W	Do.
Long Point	42 34	80 08	1896.8	3 55.0 W	4 16 W	W. J. Stewart
Turkey Point	42 39	80 20	1896.4	3 48 W	4 10 W	J. F. Fraser

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

BRITISH POSSESSIONS BETWEEN LONGITUDES 75° AND 90° WEST OF GREENWICH—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*E or W* ° ′	*E or W* ° ′	
Normandale	42 42	80 20	1896.0	2 35 W	2 59 W	Anderson & Stewart
Port Dover	42 47	80 12	1896.3	4 12 W	4 35 W	Do.
Mohawk Island	42 50	79 37	1870.5	2 40 W	4 54 W	Light-House list
Port Maitland	42 51	79 35	1896.0	4 59 W	5 23 W	Stewart & Fraser
Ridgeway	42 52	79 04	1875.6	3 33 W	5 29 W	J. Eisenmann
Port Colborne	42 53	79 16	1896.8	5 23.6 W	5 44 W	W. J. Stewart
Lake Wawanash	43 01	82 19	1859.7	0 40 W	3 00 W	H. C. Penny
Port Dalhousie	43 12	79 16	1875.5	4 22 W	6 16 W	J. Eisenmann
Cape Ipperwash	43 13	82 00	1860.1	0 09.4 W	2 29 W	Smith & Penny
Toronto, Mag. Observatory	43 39	79 23	1895.2	4 46.8 W	5 08 W	O. J. Klotz
Goderich	43 44	81 43	1860.5	1 42.0 W	4 07 W	W. P. Smith
Peter Pointe	43 51	77 10	1869.5	6 W	8 30 W	Light-House list
Bowmanville	43 52	78 38	1869.5	3 30 W	5 48 W	Do.
Oshaway	43 52	78 48	1869.5	3 30 W	5 48 W	Do.
Duck Islands	43 56	76 37	1874.6	5 00 W	7 06 W	C. Donovan
Timber Island	43 57	76 50	1874.6	7 19 W	9 19 W	F. M. Towar
Point Yeo	44 03	76 30	1818.5	2 30 W	8 54 W	W. F. W. Owen
Cookstown	44 08	79 37	1880.0	4 03.7 W	5 22 W	H. Creswick
Wolf I. near Garden I.	44 11	76 29	1874.6	6 45 W	8 51 W	F. Terry
Amherst Island, east end	44 11	76 37	1874.6	7 12 W	9 18 W	F. M. Towar
Kincardine	44 11	81 37	1900.7	4 45.3 W	4 50 W	F. Anderson
Kingston	44 13	76 35	1840.5	4 00 W	9 06 W	
Hallidays Point	44 14	76 18	1873.5	7 30 W	9 42 W	H. Custer
Wolfe Island, Browns Point	44 14	76 24	1874.7	6 25 W	8 31 W	F. M. Towar
Gananoque	44 18	76 12	1874.4	8 33 W	10 39 W	Do.
Allandale	44 20	79 41	1879.9	4 48.0 W	6 08 W	H. Creswick
Barrie, Lake Simcoe	44 21	79 37	1878.5	4 43.3 W	6 09 W	Do.
Chantry Island	44 30	81 24	1900.8	5 53.3 W	5 58 W	F. Anderson
Collingwood Harbor	44 30	80 14	1894.6	4 31 W	5 01 W	Stewart and Campbell
Nattawasaga River	44 32	80 01	1893.7	5 42 W	6 15 W	F. Anderson
Owen Sound	44 34	80 56	1897.8	5 26.5 W	5 43 W	J. F. Fraser
3 miles west of Ogdensburg	44 42	75 34	1871.8	9 36 W	12 06 W	U. S. Lake Survey
Cape Rich	44 43	80 38	1894.3	4 36 W	5 07 W	Anderson and Stewart
2 miles above Ogdensburg	44 44	75 32	1818.5	3 30 W	.. ..	W. F. W. Owen
Vails Point	44 44	80 45	1888.6	4 16 W	5 10 W	Captain Boulton
Victoria Harbor	44 45	79 48	1892.7	5 19 W	5 56 W	F. Anderson
Burke Island	44 46	81 19	1900.9	5 41.8 W	5 47 W	Do.
Penetanguishene	44 49	80 01	1848.5	1 28 W	4 48 W	— Typer
Christian I., Indian Village	44 49	80 10	1894.6	6 08 W	6 38 W	Anderson and Stewart
Beckwith Island	44 50	80 06	1893.6	5 55 W	6 29 W	Stewart and Anderson
McGregor Harbor	44 56	81 02	1888.5	4 55 W	5 50 W	W. J. Stewart
South Watcher Island	44 57	80 04	1892.5	6 05 W	6 43 W	D. C. Campbell
Garden Island	45 00	81 23	1899.8	5 54.4 W	6 03 W	F. Anderson
Western Islands	45 05	80 25	1820.5	1 25 E	.. ..	H. W. Bayfield
Milligan Island	45 06	80 07	1891.1	4 52 W	5 36 W	Boulton and Campbell
Chin Cape	45 07	81 25	1819.5	0 39 E	.. ..	H. W. Bayfield

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

BRITISH POSSESSIONS BETWEEN LONGITUDES 75° AND 90° WEST OF GREENWICH—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*E or W* ° ′	*E or W* ° ′	
Warner Bay	45 11	81 38	1899.6	6 25.2 W	6 35 W	F. Anderson
Cape Hurd	45 14	81 51	1821.5	0 21 E	.. ..	H. W. Bayfield
Cabot Head	45 15	81 26	1819.5	0 24 E	.. ..	Do.
Tobermory Harbor	45 16	81 41	1899.5	6 44.1 W	6 54 W	W. J. Stewart
Doctor Island	45 16	81 41	1884.6	5 53 W	7 05 W	Captain Boulton
Reid Island	45 19	80 16	1898.3	6 38.0 W	6 53 W	F. Anderson
Cove Island	45 20	81 44	1898.5	6 53.0 W	7 07 W	Do.
Ottawa	45 21	75 42	1875.8	10 00.5 W	12 07 W	R. Sparks
Silbow Rock	45 21	80 03	1890.4	5 56 W	6 42 W	W. J. Stewart
Mink Islands	45 22	80 25	1890.5	5 06 W	5 52 W	Boulton and Stewart
Fitzwilliam I., SW. Point	45 26	81 49	1899.8	4 30.5 W	4 39 W	W. J. Stewart
Halfmoon Island	45 27	81 35	1821.5	0 22 E	.. ..	H. W. Bayfield
Manitoulin Island	45 28	81 54	1821.5	1 13 E	.. ..	H. W. Bayfield
Point Aylmer	45 29	75 48	1843.5	6 58 W	12 17 W	J. H. Lefroy
Rattlesnake Harbor	45 32	81 43	1899.8	6 22.7 W	6 32 W	F. Anderson
Isles off Franklin Inlet	45 33	80 38	1821.5	0 40 E	.. ..	H. W. Bayfield
Point au Baril Harbor	45 33	80 30	1889.5	5 09 W	6 00 W	Captain Boulton
Club Island	45 34	81 36	1900.8	6 32.0 W	6 37 W	W. J. Stewart
South Bay Mouth	45 34	82 00	1899.4	3 47.0 W	3 58 W	F. Anderson
Erie Shingle	45 34	81 38	1884.8	4 45 W	6 00 W	Captain Boulton
Portage du Fort	45 36	76 53	1843.5	5 11 W	10 30 W	J. H. Lefroy
Alfred Township	45 37	75 12	1843.5	6 58 W	12 17 W	Do.
White-shingle Bank	45 37	81 31	1821.5	0 21 E	.. ..	H. W. Bayfield
Outer Duck Island	45 39	82 56	1897.7	2 07.5 W	2 27 W	J. F. Fraser
Great Duck Island	45 39	82 56	1897.8	2 00.2 W	2 19 W	Do.
Fanny Island	45 44	81 48	1885.7	3 41 W	4 54 W	Captain Boulton
Macnab Rocks	45 45	80 39	1888.0	4 19 W	5 22 W	Boulton and Campbell
Western Duck Island	45 45	82 57	1897.7	3 00 W	3 19 W	J. F. Fraser
Misery Bay	45 47	82 45	1898.6	3 18.0 W	3 33 W	F. Anderson
Burnt Island	45 49	82 57	1897.7	3 07.2 W	3 26 W	J. F. Fraser
West Bay Indian Village	45 50	82 10	1886.4	5 12 W	6 22 W	Captain Boulton
Squaw Island, West Rock	45 50	81 29	1884.9	1 07 W	2 24 W	Do.
West Mound	45 50	81 39	1885.4	3 42 W	4 56 W	Do.
Island off Henvey Inlet	45 51	80 53	1821.5	1 33 E	.. ..	H. W. Bayfield
Gull Island	45 51	81 16	1885.4	5 02 W	6 17 W	D. C. Campbell
Murray Rocks	45 52	80 48	1886.7	5 38 W	6 47 W	Boulton and Campbell
Small island west side Mississauga Straits	45 52	83 18	1897.6	4 39.8 W	5 00 W	J. F. Fraser
Manitoulin Island	45 53	83 13	1897.6	3 27 W	3 47 W	Do.
Ridant Island	45 54	80 56	1886.6	7 20 W	8 29 W	Captain Boulton
Little Cockburn Island	45 54	83 30	1897.8	3 28.6 W	3 48 W	J. F. Fraser
Islet off Grondines Point	45 54	81 15	1821.5	0 32 W	.. ..	H. W. Bayfield
Henry Island	45 55	82 46	1887.7	3 58 W	5 10 W	Captain Boulton
Gore Bay Harbor	45 55	82 28	1887.4	3 32 W	4 45 W	Do.
Graburn Island	45 55	80 55	1886.7	6 50 W	8 00 W	D. C. Campbell
Kokanongwi Shingle	45 56	81 34	1885.5	2 51 W	4 10 W	Do.
Drummond Island	45 56	83 42	1859.5	0 13 E	2 33 W	
Lake Huron	45 57	81 32	1843.5	0 38 W	4 05 W	J. H. Lefroy
Point on shore	45 57	81 38	1821.5	0 31 W	. ..	H. W. Bayfield
Gore Bay Light-House	45 57	82 29	1885.5	6 02 W	7 20 W	Captain Boulton
Strawberry Island L. H.	45 58	81 51	1885.6	3 46 W	5 00 W	D. C. Campbell

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

BRITISH POSSESSIONS BETWEEN LONGITUDES 75° AND 90° WEST OF GREENWICH—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*E or W* ° ′	*E or W* ° ′	
Little Current	45 59	81 55	1900.8	4 23.4 W	4 29 W	F. Anderson
Beverly Island	46 00	82 15	1886.8	5 02 W	6 15 W	Campbell and Stewart
Bedford Island	46 02	82 01	1885.7	3 43 W	5 00 W	Boulton & Stewart
St. Joseph Island	46 04	84 09	1822.5	3 00 E	. . .	H. W. Bayfield
Fort la Cloche	46 07	82 25	1843.5	1 58 W	5 14 W	J. H. Lefroy
Missisauga	46 08	83 10	1843.5	0 55 W	4 11 W	Do.
Grant Island	46 09	83 18	1886.5	2 43 W	4 00 W	Captain Boulton
Aird Island	46 09	82 22	1887.8	3 44 W	4 55 W	Do.
Cranberry Bay	46 11	83 03	1845.5	0 25 W	3 41 W	J. H. Lefroy
Rocher Capitaine	46 15	78 20	1843.5	4 48 W	8 57 W	Do.
Thessalon Point	46 16	83 31	1843.5	0 31 W	3 47 W	Do.
St. Joseph Island, Hilton	46 16	83 54	1889.4	2 38 W	3 41 W	W. J. Stewart
St. Joseph Island, Gravel Pt.	46 16	83 50	1889.4	2 36 W	3 39 W	Do.
Portage de la Grande Vase	46 19	79 07	1843.5	3 52 W	8 00 W	J. H. Lefroy
Campement d'Ours	46 20	83 56	1845.5	0 03 E	3 13 W	Do.
Portlock Harbor	46 20	84 07	1822.5	2 51 E	. . .	H. W. Bayfield
Forshaw Island	46 20	84 05	1889.5	2 51 W	3 53 W	W. J. Stewart
Mission Point	46 27	84 36	1855.6	2 09 E	0 50 W	E. P. Scammon
Pointe aux Pins	46 28	84 28	1855.5	1 21 E	1 37 W	Do.
Point Iroquois	46 29	84 47	1824.5	3 22 E	. . .	H. W. Bayfield
Head of Lake George	46 32	84 20	1825.5	3 19 E	. . .	Do.
Parisian Island	46 40	84 43	1895.6	2 22.5 W	2 55 W	E. E. Haskell
Goulais Point	46 41	84 33	1867.6	0 23 E	1 53 W	O. N. Chaffee
South Sandy Island	46 48	84 39	1867.5	0 15 E	2 01 W	Do.
North Sandy Island	46 50	84 39	1895.7	2 34.4 W	3 06 W	E. E. Haskell
Pointe aux Crêpes	46 58	84 58	1843.5	2 15 E	1 01 W	J. H. Lefroy
Little Trout River	47 09	88 54	1824.5	9 12 E	. . .	H. W. Bayfield
Montreal Island	47 19	84 52	1824.5	3 28 E	. . .	Do.
Cape Gargantua (1)	47 34	84 58	1895.4	2 52.0 W	3 25 W	E. E. Haskell
Cape Gargantua (2)	47 34	84 58	1895.4	1 33.2 W	2 06 W	Do.
Near Dog River	47 52	85 24	1843.5	2 22 E	0 54 W	J. H. Lefroy
Le Petit Mort	47 58	85 49	1843.5	4 59 E	1 43 E	Do.
Grand Portage	47 58	89 49	1824.5	11 00 E	. . .	H. W. Bayfield
Otter Head	48 05	86 10	1824.5	5 07 E	. . .	Do.
Tip Top	48 15	88 06	1871.6	0 03 E	2 07 W	C. B. Comstock
Fort William	48 24	89 23	1844.5	6 21 E	3 16 E	J. H. Lefroy
Bad Portage	48 29	89 40	1843.5	5 33 E	2 22 E	Do.
Trembling Portage	48 31	90 00	1857.5	6 21 E	3 28 E	J. Palliser
White River	48 33	86 27	1844.5	2 10 E	0 55 W	J. H. Lefroy
Fort Pic	48 38	86 39	1844.5	5 31 E	2 26 E	Do.
Peninsula Harbor	48 44	86 28	1824.5	6 20 E	. . .	H. W. Bayfield
Point on shore	48 44	87 00	1824.5	7 42 E	. . .	Do.
Height of land	48 45	85 ‹5	1874.5	1 00 E	1 00 W	W. A. Austin
Isle St. Ignace	48 45	88 02	1824.5	8 15 E	. . .	H. W. Bayfield
Halting Place	48 45	89 53	1857.5	8 54 E	6 00 E	J. Palliser
St. Ignace Harbor, obs. post	48 47	87 49	1871.7	6 26 E	4 15 E	G. A. Marr
Dog Lake	48 47	89 40	1843.5	6 26 E	3 15 E	J. H. Lefroy
Terre Plate	48 49	87 45	1843.5	5 40 E	2 28 E	Do.
Halting Place	48 55	89 54	1857.5	9 05 E	6 10 E	J. Palliser

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

BRITISH POSSESSIONS SOUTH OF LATITUDE 51° AND WEST OF LONGITUDE 90° WEST OF GREENWICH

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group I	° ′	° ′		*East* ° ′	*East* ° ′	
Beechey Head	48 20	123 39	1892.80	24 37.0	24 55	J. J. Gilbert
Sherringham	48 23	123 55	1893.55	22 43.0	23 00	Do.
Esquimalt	48 25	123 26	1881.75	22 55.6	23 36	H. E. Nichols
Discovery Island	48 26	123 14	1892.71	23 11.0	23 30	J. J. Gilbert
Arch Rock	48 28	124 12	1893.60	25 37.8	25 55	Do.
Vancouver Island	48 34	124 38	1893.63	23 51.3	24 08	Do.
Columbia River, east side	49 00	117 37	1901.80	23 18.2	23 18	O. B. French
Carson	49 00	118 29	1901.56	23 47.5	23 47	C. H. Sinclair
Midway	49 00	118 44	1901.54	23 01.4	23 01	Do.
Silicia Creek	49 01	121 36	1901.43	26 45.8	26 46	H. F. Flynn
Departure Bay	49 13	123 57	1881.77	23 55.6	24 36	H. E. Nichols
Friendly Cove	49 36	126 38	1881.74	23 36.2	24 17	Do.
Union Spit	49 40	124 55	1900.7	25 57.5	26 00	W. Weinrich
Comox	49 40	124 55	1900.8	25 53.6	25 56	Do.
North Harbor	50 29	128 04	1881.73	24 53.7	25 34	H. E. Nichols
Anchorage Cove	50 53	126 12	1881.59	25 42.7	26 24	Do.
Waddington Harbor	50 54	124 50	1881.58	25 22.0	26 03	Do.
Group II						
Second Portage	48 15	92 27	1843.5	10 15	.. ..	J. H. Lefroy
Whiffen Spit	48 22	123 44	1864.5	20 20	.. ..	— Pender
Off Cape Beale	48 22	125 30	1788.5	18 30	.. ..	Meares
Ile à la Crosse Lake	48 24	92 10	1843.5	7 53	.. ..	J. H. Lefroy
Esquimalt	48 26	123 28	1898.3	23 42.9	23 50	H. M. S. Egeria
Halting Place	48 27	92 30	1857.5	9 53	.. ..	J. Palliser
Port San Juan	48 31	124 30	1841.5	22 30	.. ..	C. Wilkes
Rainy Lake	48 32	92 56	1843.5	11 28	.. ..	J. H. Lefroy
Pickerel Lake	48 35	91 12	1857.5	8 14	.. ..	J. Palliser
Deux Rivières Portage	48 35	91 27	1843.5	11 00	.. ..	J. H. Lefroy
Fort Frances	48 37	93 29	1857.5	9 31	.. ..	J. Palliser
En., Juan de Fuca Strait	48 37	124 54	1788.6	19 14	.. ..	C. Duncan
Rainy River	48 48	94 31	1843.5	13 07	.. ..	J. H. Lefroy
Halting Lake	48 50	93 58	1857.5	11 20	.. ..	J. Palliser
Savanne Portage	48 53	90 08	1857.5	6 53	.. ..	Do.
Osoyoos Station	49 00	119 24	1860.5	22 14	22 36	R. W. Haig
Ashtnolou Station	49 00	120 00	1860.5	22 44	23 06	Do.
Onchucklin Harbor	49 00	125 00	1861.5	24 13	25 18	— Richards
Akamina Station	49 01	114 04	1861.5	23 12	23 06	R. W. Haig
Magnetic Station	49 01	121 45	1860.0	22 55	23 42	J. S. Harris
Sumass Prairie	49 01	122 12	1858.5	21 30	22 18	R. W. Haig
Semi-ah-moo	49 01	122 47	1857.8	22 54.5	23 48	J. S. Harris
Schweltza Lake	49 02	122 00	1859.5	21 37	22 30	R. W. Haig
Magnetic Station	49 03	120 55	1860.0	24 19	25 00	J. S. Harris
Do.	49 05	121 07	1860.0	22 23	23 06	Do.
Northwest Territory Station	49 06	113 50	1879.2	23 22	23 03	J. C. Nelson
Garry Point, Fraser River	49 07	123 11	1864.5	22 58	23 40	— Pender
On Ashtnolou River	49 08	120 00	1860.5	22 00	22 30	R. W. Haig
Nanaimo	49 10	124 00	1862.5	22 57	24 00	— Richards
Ahomet(?)	49 12	126 12?	1788.5	19 40	.. ..	C. Duncan
New Westminster	49 13	122 53	1862.5	22 40	23 36	— Richards
Barclay Sound	49 14	124 50	1861.5	24 37	25 42	Do.
Port Cox or Clayoquot	49 14	125 50	1787.5	19 30	.. ..	— Buckley
Hecate Bay	49 15	125 56	1861.5	22 39	23 48	— Richards

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

BRITISH POSSESSIONS SOUTH OF LATITUDE 51° AND WEST OF LONGITUDE 90° WEST OF GREENWICH—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Jericho	49 16	123 12	1891.6	23 42	24 03	W. J. Stewart
Port Moody	49 17	122 51	1891.5	23 00	23 21	Do.
Seymour Creek	49 18	123 01	1891.6	24 04	24 25	Do.
Vancouver	49 18	123 07	1898.4	24 30	24 37	H. M. S. Egeria
Northwest Territory Station	49 20	113 40	1879.2	22 59	22 40	J. C. Nelson
Do.	49 25	113 40	1879.2	22 58	22 40	Do.
Halting Place	49 26	94 48	1857.5	10 17	.. ..	J. Palliser
Lake of the Woods	49 28	94 42	1843.5	12 53	.. ..	J. H. Lefroy
Maple Spit	49 28	124 45	1898.4	24 25.7	24 33	H. M. S. Egeria
Northwest Territory Station	49 30	113 22	1879.2	22 36	22 17	J. C. Nelson
Magnetic Station	49 32	115 35	1860.0	23 34	23 40	J. S. Harris
Town of Yale	49 34	121 25	1871.5	24.00	24 30	J. Trutch
Beak Point	49 37	124 51	1898.6	24 14.1	24 21	H. M. S. Egeria
Station S, the Gap	49 38	109 51	1880.6	21 43.7	21 14	W. F. King
Station U	49 39	112 18	1880.6	22 22.7	22 04	Do.
Station T	49 40	111 38	1880.6	21 51.8	21 30	Do.
Comox, Goose Spit	49 40	124 56	1898.3	26 14.7	26 22	H. M. S. Egeria
Head of Howe Sound	49 42	123 09	1873.5	23 54	24 20	C. H. Gamsby
Northwest Territory Station	49 43	112 50	1879.1	22 28	22 06	J. C. Nelson
Station V, at Willow Creek	49 45	113 24	1880.6	22 38.1	22 12	W. F. King
Upper Fort Garry	49 53	97 02	1843.5	16 00	.. ..	J. H. Lefroy
Northwest Territory Station	49 53	112 30	1879.1	22 46	22 24	J. C. Nelson
Do.	49 55	111 40	1879.1	22 24	21 54	Do.
Station R, at Maple Creek	50 03	108 51	1880.6	22 00.0	21 20	W. F. King
Duncan Bay	50 04	125 19	1896.8	24 57.0	25 07	H.M.S.Imperieuse
Menzies Bay	50 08	125 24	1895.6	24 02.0	24 15	H. M. S. Nymphe
Squirrel Cove	50 08	124 57	1864.5	23 56	24 42	— Pender
Winnipeg River	50 10	95 09	1844.0	11 55	.. ..	J. H. Lefroy
Pinawa Portage	50 12	96 03	1843.5	12 48	.. ..	Do.
Northwest Territory Station	50 12	110 30	1878.7	21 55	21 24	J. C. Nelson
Mouth of Thompson River	50 13	121 36	1871.5	25 00	25 36	J. Trutch
Port Brooks	50.18	128 13	1787.5	22 30	.. ..	J. Johnstone
Station W	50 22	113 49	1880.6	22 03.0	21 40	W. F. King
Station Q, Reed Lake	50 27	107 22	1880.6	21 35.0	20 50	Do.
Thompson River, mouth of Nicola	50 27	121 22	1871.5	25 30	26 06	J. Trutch
Lake Winnipeg	50 28	96 35	1857.5	14 25	.. ..	J. Palliser
Station P	50 29	106 47	1880.6	21 18.7	20 30	W. F. King
Northwest Territory Station	50 30	110 20	1878.7	23 14 (?)	22 42	J. C. Nelson
Fort Alexander	50 37	96 21	1844.0	14 14	.. ..	J. H. Lefroy
Thompson River	50 41	120 12	1871.5	24 00	24 30	J. Trutch
Station A	50 42	102 00	1880.4	18 50.7	17 45	W. F. King
Thompson River, near Kamloops	50 42	120 30	1877.5	24 15	24 35	C. E. Perry
Beaver Harbor	50 43	127 25	1866.5	24 30	25 24	— Pender
Station M	50 44	105 14	1880.5	20 21.3	19 30	W. F. King
Station B	50 45	101 31	1880.4	17 10.8	16 05	Do.
Station K, near Fort Qu'Appelle	50 46	103 48	1880.5	19 35.1	18 40	Do.
Thompson River	50 46	121 05	1871.5	23 30	24 00	J. Trutch
Station N	50 47	105 51	1880.5	20 36.3	19 45	W. F. King
Mouth of Hat Creek	50 47	121 33	1873.5	27 00	27 30	E. W. Jarvis
Northwest Territory Station	50 48	113 18	1879.9	23 00	22 40	J. C. Nelson
Station L	50 49	104 16	1880.53	19 10.7	18 16	W. F. King

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

BRITISH POSSESSIONS, SOUTH OF LATITUDE 51° AND WEST OF LONGITUDE 90° WEST OF GREENWICH—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
On Little Shuswap	50 50	119 46	1871.5	24 30	25 00	J. Trutch
Tracey Harbor	50 51	126 53	1863.5	26 40	27 30	— Pender
Northwest Territory Station	50 52	114 00	1879.8	24 19	24 04	J. C. Nelson
Magnetic Station	50 55	107 29	1860.0	24 31	23 36	J. Palliser
Northwest Territory Station	50 55	110 00	1878.7	23 50 (?)	23 18	J. C. Nelson
Do.	50 56	114 10	1879.9	24 30	24 06	Do.
North Thompson River	50 57	120 28	1871.5	23 52.5	24 18	J. Trutch
Land Survey Station	50 58	110 40	1882.59	22 37.1	22 06	W. Ogilvie

BRITISH POSSESSIONS, NORTH OF LATITUDE 51° AND WEST OF LONGITUDE 90° WEST OF GREENWICH

Group I	° ′	° ′		*East* ° ′	*East* ° ′	
Port McLaughlin	52 08	128 10	1881.60	26 42.9	27 30	H. E. Nichols
Rose Harbor	52 09	131 15	1881.72	26 00.6	26 48	Do.
Port Simpson	54 34	130 26	1895.40	28 37.2	28 54	O. B. French
Lion Point	55 53	130 01	1895.41	30 13.4	30 30	P. A. Welker
Group II						
Station X	51 02	114 00	1880.7	24 13.4	.. ..	W. F. King
Land Survey Station	51 03	112 14	1882.6	23 19.1	.. ..	W. Ogilvie
Lake Winnipeg	51 04	96 45	1843.5	14 14	.. ..	J. H. Lefroy
Station O	51 05	106 37	1880.5	21 18.6	.. ..	W. F. King
Northwest Territory Station	51 05	115 00	1879.6	23 58	.. ..	J. C. Nelson
Treadmill Harbor	51 06	127 34	1864.5	24 08	.. ..	— Pender
Station J	51 12	103 54	1880.5	19 50.0	.. ..	W. F. King
North Thompson River	51 12	120 22	1871.5	24 07.5	.. ..	J. Trutch
Station I	51 22	104 00	1880.5	18 33.6	.. ..	W. F. King
North Thompson River	51 28	120 25	1873.5	25 20	.. ..	E. W. Jarvis
Station H, on Pelly Trail	51 32	103 43	1880.5	19 52.0	.. ..	W. F. King
Safety Cove	51 32	127 57	1864.5	23 38	.. ..	— Pender
North Thompson River	51 33	120 17	1871.5	25 30	.. ..	J. Trutch
Lake Winnipeg	51 36	96 42	1844.0	15 42	.. ..	J. H. Lefroy
Station G	51 39	103 08	1880.5	19 33.3	.. ..	W. F. King
Safety Port	51 41	128 31	1788.5	21 30	.. ..	C. Duncan
Station F	51 42	103 04	1880.5	19 38.2	.. ..	W. F. King
Station E	51 44	102 29	1880.5	18 56.0	.. ..	Do.
Lake Winnipeg	51 45	96 53	1843.5	15 57	.. ..	J. H. Lefroy
Station D, Assiniboine R.	51 45	102 01	1880.5	20 12.6	.. ..	W. F. King
Fort Pelly	51 45	102 05	1836.9	17 00	.. ..	Th. Simpson
Station Z	51 52	114 00	1880.7	24 15.8	.. ..	W. F. King
Station C, Swan River Bar	51 54	101 57	1880.4	19 37.3	.. ..	Do.
Rose Harbor	52 09	131 20	1787	23 00	.. ..	J. Johnstone
Clearwater River	52 12	120 12	1873.5	24 30	.. ..	E. W. Jarvis
Kynumpt Harbor	52 12	128 12	1866.5	26 10	.. ..	— Pender
Milbank Sound, Cove	52 14	129 00	1788.5	23 00	.. .	C. Duncan
Lake Winnipeg	52 15	97 07	1843.5	15 37	.. ..	J. H. Lefroy
Saskatchewan River	52 23	107 04	1844.5	25 21	.. ..	Do.
North Bentinck Arm	52 23	126 48	1864.5	24 46	.. ..	— Pender
Etches Sound	52 25?	131 48?	1788.5	23 30	.. ..	C. Duncan
Carter Bay	52 50	128 25	1866.5	25 59	.. ..	— Pender

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

BRITISH POSSESSIONS, NORTH OF LATITUDE 51° AND WEST OF LONGITUDE 90° WEST OF GREENWICH—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Carlton House	52 51	106 32	1844.5	22 55	.. ..	J. H. Lefroy
Head of Dean Inlet	52 52	127 13	1876.5	27 00	.. ..	W. S. Jennings
Tête Janne Cache	52 58	119 50	1876.5	26 20	.. ..	G. A. Keefer
Station a, Pipestone Creek	53 04	113 35	1880.7	25 14.4	.. ..	W. F. King
Grand Rapids, Saskatchewan River	53 08	99 27	1884.6	15 38	.. ..	O. J. Klotz
Saskatchewan River, *a*	53 10	104 50	1884.4	21 54	.. ..	Do.
Grand Rapids, *e*	53 12	99 30	1884.5	15 18	.. ..	Do.
Grand Rapids, j	53 12	99 33	1884.5	16 58.2	.. ..	Do.
Calamity Harbor	53 12	130 24	1787.5	23 20	.. ..	J. Johnstone
Anchor Cove	53 12	132 14	1866.5	24 59	.. ..	— Pender
Hudson Bay Co., Post	53 13	99 29	1884.5	15 42	.. ..	O. J. Klotz
Near Fort à la Corne	53 13	104 52	1884.4	21 50	.. ..	Do.
Forks of Saskatchewan R.	53 14	105 05	1884.4	21 24	.. ..	Do.
Head of Gardner Inlet	53 15	127 37	1875.5	26 30	.. ..	Horetzky & Gamsby
Saskatchewan River, b	53 16	100 01	1884.5	18 00	.. ..	O. J. Klotz
Jasper House	53 16	118 10	1871.5	26 00	.. ..	W. Moberly
Saskatchewan, Chemahawin.	53 20	100 32	1884.5	17 42	.. ..	O. J. Klotz
Saskatchewan, Y	53 21	104 02	1884.4	18 36	.. ..	Do.
North Saskatchewan River	53 23	114 19	1876.5	26 30	.. ..	N. Ruttan
Port Stepteen	53 30	130 12	1788.5	24 10	.. ..	C. Duncan
Saskatchewan River, L	53 31	103 49	1884.4	18 42	.. ..	O. J. Klotz
Station b, in valley near Edmonton	53 32	113 30?	1880.8	26 43.2	.. ..	W. F. King
Station d, on 14th base line	53 36	111 24	1880.8	25 46.4	.. ..	Do.
Saskatchewan River, a	53 38	103 42	1884.4	20 18	.. ..	O. J. Klotz
Saskatchewan River, h	53 40	103 28	1884.4	20 18	.. ..	Do.
Nelson R., Warren Landing	53 43	98 05	1884.6	15 54	.. ..	Do.
Saskatchewan River, N.	53 47	101 07	1884.5	18 42	.. ..	Do.
Mouth of Chilacco River	53 50	123 00	1875.5	28 15	.. ..	H. P. Bell
Saskatchewan River, ξ	53 52	103 01	1884.4	20 54	.. ..	O. J. Klotz
Alpha Bay	53 52	130 18	1866.5	26 34	.. ..	— Pender
Cumberland House	53 57	102 19	1884.5	20 12	.. ..	O. J. Klotz
Norway House	54 00	98 03	1884.6	15 02	.. ..	Do.
Saskatchewan River, j	54 02	101 35	1884.5	19 24	.. ..	Do.
Land Survey Station	54 02	114 00	1882.9	26 36.8	.. ..	W. Ogilvie
Nelson River, i	54 06	97 56	1884.6	16 36	.. ..	O. J. Klotz
Port Essington	54 14	129 47	1879.5	27 20	.. ..	G. A. Keefer
Nelson River, x	54 15	97 49	1884.6	17 36	.. ..	O. J. Klotz
Nelson River, j	54 17	97 46	1884.6	16 18	.. ..	Do.
Head of Work Inlet	54 18	129 43	1879.5	27 30	.. ..	G. A. Keefer
20 miles up Skeena River	54 19	129 19	1879.5	27 20	.. ..	Do.
Fort Assiniboine	54 20	114 28	1844.5	24 39	.. ..	J. H. Lefroy
Nelson River, ρ	54 21	97 49	1884.6	16 42	.. ..	O. J. Klotz
Nelson River, χ	54 22	97 51	1884.6	18 12	.. ..	Do.
31 miles up Skeena River	54 22	129 00	1879.5	26 45	.. ..	G. A. Keefer
Nelson River, p	54 25	97 53	1884.6	15 36	.. ..	O. J. Klotz
50 miles up Skeena River	54 30	128 35	1879.5	26 30	.. ..	G. A. Keefer
Nelson River, k	54 31	97 52	1884.6	14 54	.. ..	O. J. Klotz
Nelson River, d	54 43	97 59	1884.6	12 54	.. ..	Do.
Nelson River, o	54 45	98 06	1884.6	15 24	.. ..	Do.
Nelson River, δ	54 49	98 14	1884.6	20 30	.. ..	Do.

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

BRITISH POSSESSIONS, NORTH OF LATITUDE 51° AND WEST OF LONGITUDE 90° WEST OF GREENWICH—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Nelson River, υ & φ	54 55	98 09	1884.6	20 06	.. ..	O. J. Klotz
Nelson River, θ	55 00	98 00	1884.6	15 48	.. ..	Do.
Fort McLeod, North	55 00	123 11	1875.5	25 20	.. ..	A. Webster
Nelson River, N.	55 06	97 43	1884.6	21 18	.. ..	O. J. Klotz
Land Survey Station	55 10	114 04	1883.4	27 45.4	.. ..	W. Ogilvie
Nelson River, T	55 13	97 18	1884.6	17 24	.. ..	O. J. Klotz
Nelson River, h	55 19	97 08	1884.6	15 12	.. ..	Do.
Nelson River, w	55 27	97 00	1884.6	12 30	.. ..	Do.
Nelson River, i	55 41	96 55	1884.6	14 18	.. ..	Do.
Forks of Pine River	55 44	121 18	1875.5	28 50	.. ..	A. Webster
Nelson River, f	55 54	96 47	1884.6	18 00	.. ..	O. J. Klotz
Camp on Pearl River	55 58	123 13	1875.5	30 10	.. ..	A. Webster
Hudson's Hope	56 02	121 58	1875.5	26 02	.. ..	Do.
Head of Rocky Mt. Portage	56 03	122 15	1875.5	28 08	.. ..	Do.
Nelson River, R	56 04	96 47	1884.6	16 54	.. ..	O. J. Klotz
Land Survey Station	56 10	117 47	1883.7	30 10.4	.. ..	W. Ogilvie
Nelson River, E	56 11	96 26	1884.6	14 06	.. ..	O. J. Klotz
Fort St. John	56 12	121 14	1875.5	26 00	.. ..	A. Webster
Nelson River, K	56 14	96 08	1884.6	13 12	.. ..	O. J. Klotz
Nelson River, f	56 16	95 50	1884.6	16 36	.. ..	Do.
Nelson River, a	56 16	96 00	1884.6	14 24	.. ..	Do.
Nelson River, z	56 19	95 29	1884.6	10 06	.. ..	Do.
Nelson River, Z	56 21	94 46	1884.6	13 48	.. ..	Do.
Nelson River, V	56 21	94 53	1884.6	9 24	.. ..	Do.
Nelson River, M	56 21	95 02	1884.6	12 30	.. ..	Do.
Nelson River, φ	56 21	95 13	1884.6	9 54	.. ..	Do.
Nelson River, P	56 27	94 26	1884.7	10 18	.. ..	Do.
Nelson River, zz	56 34	94 12	1884.7	11 24	.. ..	Do.
Nelson River, n	56 49	93 59	1884.7	8 24	.. ..	Do.
Nelson River, f	56 54	93 05	1884.7	7 12	.. ..	Do.
Nelson River, ψ	56 54	93 16	1884.7	2 54 (?)	.. ..	Do.
Nelson River, N	56 59	92 54	1884.7	7 42	.. ..	Do.
York Factory	57 00	92 26	1884.7	6 39.6	.. ..	Do.
Magnetic Station	58 28	130 02	1887	30 26	.. ..	G. M. Dawson
Fort Chipewyan	58 43	111 19	1888.9	27 14.2	.. ..	W. Ogilvie
Lake Lindeman	59 47	135 05	1887.5	32 16.8	.. ..	Do.
Lake Marsh	60 21	134 17	1887.5	32 46.1	.. ..	Do.
Miles Canyon	60 42	135 04	1887.6	30 55.2	.. ..	Do.
Fort Resolution	61 10	113 46	1888.7	38 19.9	.. ..	Do.
Magnetic Station	61 29	129 39	1887	33 45	.. ..	G. M. Dawson
Do.	61 49	131 01	1887	34 30	.. ..	Do.
Fort Simpson	61 52	121 25	1888.6	37 42.3	.. ..	W. Ogilvie
Lewes River	62 04	136 04	1887.6	33 54.8	.. ..	Do.
Fort Rae	62 39	115 44	1883.2	40 11.0	.. ..	H. P. Dawson
Fort Selkirk	62 48	137 25	1887.6	34 17.0	.. ..	W. Ogilvie
White River	63 12	139 38	1887.6	34 27.9	.. ..	Do.
Stewart River	63 22	139 28	1887.6	33 52.8	.. ..	Do.
Fortymile River	64 26	140 32	1887.7	35 01.1	.. ..	Do.
Mackenzie River	64 27	125 03	1888.6	41 34.6	.. ..	Do.
International Boundary	64 41	140 54	1888.2	35 47.5	.. ..	Do.
Fort Norman	64 54	125 43	1888.6	33 39.0	.. ..	Do.
Porcupine River	65 43	139 40	1888.4	37 34.0	.. ..	Do.
Fort Good Hope	66 16	128 31	1888.5	41 30.9	.. ..	Do.
Fort McPherson	67 26	134 57	1888.5	46 00.8	.. ..	Do.

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Continued.

BRITISH POSSESSIONS, NORTH OF LATITUDE 51° AND WEST OF LONGITUDE 90° WEST OF GREENWICH—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Red River	67 27	133 36	1826.5	45 37	.. ..	J. Franklin
Shoalwater Bay	68 54	136 21	1837.5	49 22	.. ..	Th. Simpson
Richardson Chain	69 01	137 25	1826.5	46 41	.. ..	J. Franklin
Point Kay	69 18	138 08	1837.5	49 00	.. ..	Th. Simpson
Herschel I., southeast side	69 33	138 57	1889.6	43 40	.. ..	C. H. Stockton
Herschel Island	69 36	139 42	1826.5	46 13	.. ..	J. Franklin
Clarence Bay	69 38	140 51	1826.5	45 43	.. ..	Do.

WATERS ADJACENT TO ALASKA AND EASTERN SIBERIA

Group II	° ′	° ′		*E or W* ° ′	*E or W* ° ′	
At Sea	45 14	159 41	1850.0	18 45 E	.. ..	H. Kellet
Do.	45 19	160 00	1850.0	17 46 E	.. ..	Do.
Do.	45 33	E161 05	1849.5	4 30 E	.. ..	Do.
Do.	47 28	E159 45	1849.5	4 00 E	.. ..	Do.
Do.	48 08	146 39	1827.5	22 35 E	.. ..	F. P. Lütke
Do.	48 34	E164 38	1851.5	7 10 E	.. ..	R. Collinson
Do.	48 44	143 23	1827.5	23 01 E	.. ..	F. P. Lütke
Do.	48 49	E158 13	1849.5	4 23 E	.. ..	H. Kellet
Do.	50 05	E158 39	1848.5	2 19 E	.. ..	Do.
Do.	50 50	E166 37	1850.5	5 54 E	.. ..	R. Collinson
Do.	51 46	152 36	1830.5	24 05 E	.. ..	A. Erman
Do.	51 54	E168 38	1854.5	8 36 E	.. ..	R. Collinson
Do.	51 55	143 33	1827.0	24 30 E	.. ..	F. P. Lütke
Do.	53 00	149 56	1830.5	25 33 E	.. ..	A. Erman
Petropavlovsk, Kamchatka	53 01	E158 43	1896.6	1 05 W	1 15 W	J. F. Moser
Natschika, Kamchatka	53 07	E157 25	1829.5	4 00 E	.. ..	A. Erman
At Sea	53 36	143 38	1850.5	24 46 E	.. ..	R. Collinson
Bering I., Nicholski Bay	55 10	E166 01	1892.5	3 37 E	3 12 E	Z. L. Tanner
Bering Island	55 14	E165 52	1879.6	3 56 E	.. ..	A. Wÿkander
At Sea	57 21	E167 24	1854.5	12 40 E	.. ..	R. Collinson
Do.	58 19	E169 08	1849.5	9 41 E	.. ..	H. Kellet
Do.	59 05	E169 49	1849.5	10 17 E	.. ..	Do.
Do.	59 32	E173 12	1849.5	10 28 E	.. ..	R. Collinson
Do.	59 38	E171 10	1849.5	10 54 E	.. ..	H. Kellet
Do.	61 20	E177 23	1850.5	14 07 E	.. ..	R. Collinson
Plover Bay, Siberia	64 22	173 22	1880.7	18 25.5 E	.. ..	Dall & Baker
At Sea	64 47	171 35	1881.4	23 10 E	.. ..	C. L. Hooper
Konyam Bay	64 50	172 57	1879.6	17 52 E	.. ..	A. Wÿkander
Holy Cross Bay, Siberia	65 28	178 32	1828.5	21 04 E	.. ..	F. P. Lütke
St. Laurence Bay	65 35	170 44	1879.5	20 23 E	.. ..	A. Wÿkander
At Sea	65 35	170 45	1881.4	23 25 E	.. ..	C. L. Hooper
Bay of St. Laurence	65 38	170 46	1828.5	24 04 E	.. ..	F. P. Lütke
Big Diomede Island	65 45	169 04	1880.7	21 49.2 E	.. ..	Dall & Baker
At Sea	65 47	168 55	1881.4	22 50 E	.. ..	C. L. Hooper
Do.	66 07	169 17	1881.4	23 40 E	.. ..	Do.
Do.	66 16	161 46	1881.7	27 03 E	.. ..	Do.
At Sea, Arctic Ocean	66 42	170 46	1881.4	24 00 E	.. ..	Do.
Pitlekai	67 05	173 30	1878.7	19 43 E	.. ..	A. Wÿkander
At Sea, Arctic Ocean	67 17	171 45	1881.4	22 30 E	.. ..	C. L. Hooper

Table of the most recent magnetic declinations observed in the United States and outlying territories reduced to January 1, 1902—Concluded.

WATERS ADJACENT TO ALASKA AND EASTERN SIBERIA—Continued

Station	Latitude	Longitude	Date of observation	Declination observed	Declination in 1902	Observer or authority
Group II—Continued	° ′	° ′		*East* ° ′	*East* ° ′	
Koliuchin Island, Siberia	67 27	175 35	1823.5	23 26 E	.. ..	F. v. Wrangell
Wankarem River, Siberia	67 43	176 27	1823.5	23 00 E	.. ..	Do.
At Sea, off Koliuchin Bay	67 52	175 18	1881.6	19 49 E	.. ..	C. L. Hooper
Do.	67 58	175 14	1881.4	23 30 E	.. ..	Do.
At Sea, off Cape Lisburne	68 50	165 10	1881.6	32 04 E	.. ..	Do.
Irkaipi	68 50	180 00	1878.7	17 54 E	.. ..	A. Wykander
North Cape, Siberia	68 55	E179 56	1823.5	21 40 E	.. ..	F. v. Wrangell
East of Cape Jakan	69 36	E176 58	1823.5	21 30 E	.. ..	Do.
Werkon River, Siberia	69 53	E173 32	1823.5	18 57 E	.. ..	Do.
At Sea, Arctic Ocean	69 58	162 38	1881.6	31 55 E	.. ..	C. L. Hooper
Kosmin Rock	70 01	E171 55	1823.5	18 00 E	.. ..	F. v. Wrangell
Cape Schelagskoi	70 03	E171 03	1823.5	18 03 E	.. ..	Do.
At Sea, off Icy Cape	70 05	162 06	1881.6	32 14 E	.. ..	C. L. Hooper
Do.	70 15	161 55	1881.6	32 12 E	.. ..	Do.
Magnetic Station, Siberia	70 20	E174 13	1823.5	21 30 E	.. ..	F. v. Wrangell
At Sea, off Herald Island	70 49	174 32	1881.6	24 47 E	.. ..	C. L. Hooper
Do.	70 51	175 40	1881.6	23 26 E	.. ..	Do.
Wrangell I., south coast	70 57	178 10	1881.6	19 55 E	.. ..	Berry & Putnam
Wrangell Island, east coast	71 04	177 40	1881.6	23 26 E	.. ..	C. L. Hooper
Off Point Barrow	71 20	156 15	1881.6	37 18 E	32 30 E	Do.
On Ice, Arctic Ocean	71 34	162 00	1849.6	37 00 E	.. ..	H. Kellet
Do.	72 50	164 40	1849.6	42 09 E	.. ..	Do.

DESCRIPTIONS OF MAGNETIC STATIONS OCCUPIED BY THE UNITED STATES COAST AND GEODETIC SURVEY BETWEEN 1881 AND JULY 1, 1902.

The order in which the descriptions are given is, first, alphabetically by States, and, secondly, under each State alphabetically by counties. In the case of the outlying Territories, Alaska, etc., the most convenient order appeared to be that given in the declination tables, viz., according to increasing latitude of station.

Because of the large number of the stations and the need of keeping the publication within convenient size, the descriptions had to be made as brief as possible without omitting any essential detail. Additional information can be obtained by application to the Superintendent of the Coast and Geodetic Survey, who will also be glad to receive information from those visiting stations regarding corrections necessary in the descriptions owing to changes that may have occurred since the station was established.

For collection of results and for descriptions of stations prior to 1881, see Appendix 9, Coast and Geodetic Survey Report for 1881.

ALABAMA.

Barbour County, Eufaula, 1892.—Station is on the first street west of railroad (Livingston street). Station marked by a stub of yellow pine sunk 2 feet in the ground flush with surface, in the middle of the street in front of a building owned by Mr. Vaughn.

Bullock County, Union Springs, 1900.—Station is in the inclosure of the Allegheny Observatory Eclipse Expedition. It is in the large pasture to the east of the town and south of Conecuh street, 203 feet southerly from Conecuh street, and 171 feet easterly from a large sweet-gum tree, the only tree near; marked by pine peg. It is about 100 feet nearly east of the pier on which zenith telescope was mounted. Mark, southeast corner of brick building (old mill) near railroad, bears 39° 13′.0 west of true south.

Butler County, Greenville, 1896.—Station is in northwestern suburb of city, in the edge of the pine grove south of the cemetery. Station was marked by a yellow-pine post sunk 2 feet in ground flush with surface. It is 33 feet from north fence around cemetery and 215 feet from the northeastern corner of the cemetery. Center of brick chimney of cedar factory bears 25° 25′.4 east of true south. Center of city water-works tank bears 71° 36′.1 east of true north.

Conecuh County, Evergreen, 1900.—Observations were made over a point in the open field north of the cemetery and about 1,000 feet east of the railroad track. This station is distant 205, 57, and 66 feet, respectively, from the cemetery fence, from the fence line prolonged along the street north of station, and from the row of trees in the street. The northwest corner of the foundation of the monument to Aubrey Williamson is due south of this station, which is 345 feet from the street running east of the cemetery. The mark or range used was the cupola of the tower of the agricultural school. This mark or range bears 76° 48′.6 east of true south.

Crenshaw County, Mount Carmel, 1892.—Station is in NE. ¼ of NW. ¼ sec. 15, R. 13 E., T. 17 N., on property of W. E. Davis, about 3 miles from Mount Carmel post-office. It is marked by a hole in large irregular-shaped lime rock measuring about 1 foot 6 inches by 2 feet 6 inches by 3 feet, buried 1½ inches below surface. Point is probably the most prominent in this part of the State.

ALABAMA—Continued.

Cullman County, Cullman, 1900.—Observations were made over an oak peg driven in the ground on a slight elevation in a vacant lot in the northeastern section of the town. This lot is at the intersection of the fourth street east and the fourth street north of the L. & N. R. R. station. The peg is about 25 feet east and 50 feet south of the street lines. The mark or range used was the spire of a church. This mark or range bears 12° 10′.4 east of true south.

Dallas County, Ethridge, 1892.—Station is on the highest point of land of a ridge of thickly wooded hills, about 2 miles southwest of Carlowville. Mr. J. C. Yates and his son both know locality. A three-fourths inch hole is in a large irregular-shaped limestone rock, measuring approximately 1 foot 2 inches by 1 foot 8 inches by 2 feet, marks the exact point. Rock buried 9½ inches.

Dallas County, Selma, 1896.—Station was established on the bluff next to the river, at the front of the street which runs in front of the court-house, and just one square from the court-house. This large square is just in front of Judge Craig's house. Station is in the lot adjoining the "old arsenal lot." It was marked by a pine post 24 feet from the edge of the bluff of the Alabama River and 250 feet from the outer edge of the street. Rod of cupola on Judge Craig's house bears 73° 15′.6 east of north. Rod on chimney on court-house bears 58° 26′.7 east of south. Rod on cupola of the house of Sarah Woodruff bears 48° 20′.9 east of south.

Jefferson County, Birmingham.—Observations were made over an oak peg driven in the grounds of the State fair association about a mile southwest of the court-house. This peg is east of the race track and of an open water course, from which it is distant about 70 feet. If Ninth street were prolonged through the fair grounds its east line would run very close to this peg. It is distant 194 and 297 feet, respectively, from the east fence and from the west corner of the westerly ticket office at the Fifth avenue gate, northwest of this peg. The mark or range used was the east corner of a cotton mill about 500 feet distant. This mark or range bears 0° 21′.2 west of true south.

Lauderdale County, Florence, 1890.—Observations were made over a locust post, sunk flush with surface of ground, in the south corner of the grounds of the Synodical Female College. It is 9 feet 8 inches from the west fence and 22 feet 11 inches from the south fence. Fences have since been rebuilt and moved into the street 1½ feet (about). The mark—rod on court-house—bears 16° 57′.1 west of south. Rod on first Presbyterian Church bears 84° 28′.9 east of south.

Lee County, Opelika, 1890.—The station is on Tallapoosa street, on a lot adjoining the Presbyterian Church. The station is 30 paces from the church, on a line with the front, parallel to the street. The mark or range used was the spire of Mr. Dyer's house. This mark or range bears 0° 41′ east of true south. The central rod on the new spire of the Presbyterian Church bears 24° 03′ east of true south.

Madison County, Huntsville, 1900.—Observations were made over a wooden peg located in the pasture field of the Ewing estate, 1 mile south of the city. It is near the intersection of two roads which cross at the half-section corner, marked by a stone in the road. This peg is 39½ feet west of the road running north and south and 168½ feet south of the road running east and west. In the fence line north of this peg an iron rod was driven, and this with another iron rod about 200 feet south of the peg marks the true meridian. Mr. T. M. Hooper knows the exact location of this peg. The old station in Spring Park is no longer available for magnetic observations. The mark or range used was the trunk of a large, dead sycamore tree. This mark or range bears 10° 27′.8 west of true south.

Mobile County, Citronelle, 1896.—In the orchard of the Hygeia Hotel, just south of the garden, 84 feet from the east fence and 54 feet from the north fence. Station was marked by a yellow-pine stub 2 feet long sunk flush with the surface of the ground. First rod on Judge Scott's house bears 32° 51′.0 west of south. Second rod on Judge Scott's house bears 32° 47′.5 west of south. Central chimney, Mr. Curvin's house, bears 50° 42′.5 east of north.

Mobile County, Mobile, 1896.—The station is in the large open space in the southeast corner of the grounds of the Catholic Male Orphan Asylum, in the lot joining St. Mary's Church. The exact spot is marked by a yellow-pine post sunk 2 feet in the ground, flush with the surface. It is 180 feet from the southern plank inclosure and 165 feet from the western plank inclosure. Rod on Catholic Orphan Asylum bears 67° 56′.5 east of north. Cross on St. Mary's New Catholic Church bears 44° 40′.7 east of north.

Montgomery County, Montgomery, 1900.—Observations were made over an oak peg driven in the ground at Cloverdale, about 500 feet east of the street running south from the State capitol. It is distant 252 feet nearly due south of the center of the more southerly of two pine trees standing close

ALABAMA—Continued.

together in a large open field. It is also distant 104½ and 69½ feet, respectively, from two other pines, one northeast and the other east of the peg. The terminus of the electric railway is about 750 feet north of this peg. Observations were made once before in this immediate vicinity. The mark or range used was the pole on the piazza of Mr. Barnes's house. This mark or range bears 28° 50′.4 west of true south.

Morgan County, Decatur, 1900.—Observations were made over a yellow pine peg driven in the ground in the vacant lot across the street from the Hobart Hotel, and south of it. This peg is distant 60 and 80 feet, respectively, from the street and curbstone west of the peg. It is distant 50 and 71 feet, respectively, from the street and curbstone north of the peg. It is distant about 106 and 70 feet, respectively, from the fences east and south of this peg. Observations were made once before in this lot, about 50 feet southeast of this point. The mark or range used was the pinnacle on the building adjoining the opera house. This mark or range bears 2° 51′.6 east of true south.

ALASKA.

Unalaska Island, Dutch Harbor, 1900.—The station is 30 meters south of the azimuth mark on Amaknak Island. The azimuth mark is on the west slope of the hill immediately southeast of the town of Dutch Harbor, about 100 feet from the summit. It is marked by a pole 14 feet long, firmly braced.

Round, 1901.—The magnetic station is 25 feet south from the triangulation station. The latter is on the highest point of a small round island in the entrance of Fourth of July Bay, and is marked by a drill hole in a rock sunk flush with the surface of the ground.

Strait, 1901.—The magnetic station is about 50 feet north of the triangulation station. The latter is on the outer summit of the first point to the eastward of the Beaver Bay entrance to Idagak Strait, Biorka Island, and is marked by a pile of stones over a drill hole in a rock sunk flush with the surface of the ground.

Biorka, 1901.—The magnetic station is 15 feet northwest from the triangulation station. The latter is near to and to the westward of the small bay where the old Biorka Indian village is situated. It is about 40 feet above sea level, but not on the highest summit of the point. From the station the two crosses of the Greek church in the Indian village show nearly on range. The station is marked by a cairn of rocks covering a drill hole in a stone set flush with the surface of the ground.

Egg, 1901.—The magnetic station is 60 feet south of the triangulation station. The latter is on the highest point of the western and highest summit of Egg Island, and is marked by a drill hole in a stone set flush with the surface of the ground.

Food, 1901.—The magnetic station is 75 feet east of the triangulation station. The latter is on the northeastern side of Agamgik (Food) Bay, Unalaska Island, on a point near to a large pinnacle rock at water's edge, and is marked by a cairn of stones surmounting a drill hole in a stone buried flush with the surface of the ground.

Shelf, 1901.—The magnetic station is 50 feet south of the triangulation station. The latter is on a bluff point between Deep Bay and Agamgik (Food) Bay, Unalaska Island, and is marked by a drill hole in a large stone surmounted by a pile of rocks.

Eider Point, 1901.—The station is near the end of Eider Point, Unalaska Island, just outside of the graveyard. It is marked by a pile of rocks surmounting a drill hole in a stone partly buried in the ground.

Aektok (Rootok) Pass, 1901.—On Aektok (Rootok) Island.

Basalt, 1901.—The station is on the summit of Basalt Island, a small rock island in Pathfinder Channel. It is marked by a drill hole in the bed rock and a cairn.

Tigalda, 1901.—The magnetic station is 100 feet northeast from the triangulation station, near the edge of a cliff. The triangulation station is on the summit of the ridge of the point forming the northeast side of what has been called Kelp Bay, Tigalda Island. It is marked by a cairn of rocks surrounding a 2 by 4 stub.

Tigalda Bay, 1901.—On Tigalda Island.

Ugamak, 1901.—The station is on the summit of the second peak from the northeastern end of Ugamak Island. This peak is about 900 feet high and rounded at the top. The station is marked by a cairn of rocks covering a drill hole in a stone sunk flush with the ground.

ALASKA—Continued.

Peterson, 1901.—The magnetic station is on the north side of Peterson Bay, Sannak Islands, on the top of the first bluff on the shore line west of Peterson village, about 200 yards from the middle of the village and 75 yards from the graveyard. It is about 6 feet from the edge of the bluff, and is marked by a sandstone bowlder 12 by 12 by 5 inches, set flush with the surface of the tundra. A hole was drilled in the stone and filled with lead.

Acherk, 1901.—The station is on the northwest end of Sannak Island, on the north slope of a hillside, in line with cross on the cupola of the Greek church and the triangulation station Granite, about 38 paces from the east end of the church. The station is marked by a pine stub projecting about 3 inches above ground. The mark or range used was the triangulation station Granite, which bears 64° 35′.8 east of true south.

Otter Cove, 1901.—The magnetic station is about 8 meters from Otter Cove astronomical station in line to East Base and is marked by a 2 by 4 pine stub projecting about 3 inches above ground. The mark or range used was East Base, which bears 71° 18′.7 west of true south.

Amagat Island, 1901.—The station is on the line from Amagat triangulation station to Umga Island, about 130 meters from the former. The triangulation station is on the top of the north summit of Amagat Island.

Portland Canal, south end of Pearse Island, 1888.—The triangulation station South Base is on the second rocky point from Wales Passage and is marked by a cross cut in the rock. The magnetic station is 19 feet distant in line to North Base.

Tamgas Harbor, 1883.—The magnetic station is at the extreme end of Observatory Point, on the south side of the entrance to Tamgas Harbor, about 10 feet from high-water mark. It is marked by a pine post 10 inches square projecting about 3 feet above ground.

Mary Island, 1895.—The station on Mary Island is at Custom-House Cove, just west of the custom-house, and 34.7 meters due south of the astronomical station (1895).

Portland Canal, Astronomical Point, 1888.—No description.

Peninsula Point, 1885.—The astronomical point was occupied as a magnetic station. It is near the eastern end of a high-water island, at the east entrance of Ward Cove, It is marked by a bottle 18 inches beneath the surface of the ground, with rocks piled around and above. It is 92.5 meters from Pen signal, 10.5 meters from a blazed tree, and 30 meters from a prominent rock.

Union Bay, 1885.—The astronomical station is on a small high-water island at the north entrance of the slough at the head of Union Bay, and is marked by a pile of stones. The magnetic station is on the mainland 107 meters from the astronomical station. The mark or range used was Plum signal, and bears 2° 37′.0 west of true north.

Kupreanof Harbor, 1901.—The station is on the west side of Kupreanof Harbor, where the south end of the bluff meets the flat land of the shore line and immediately opposite the south end of Cross Island. It is on the sand beach about 15 feet above the high-water line and about 30 feet north of the mouth of a small stream. A thatched house is on the shore line about half a mile south of the station. It is marked by a wooden stub 2½ inches in diameter. The mark or range used was the right-hand one of two sharp points on a mountain on the southeast side of the entrance to the harbor, and bears 21° 13′.6 east of true south.

Portland Canal, head, 1888.—No description.

Dewey Anchorage, 1886.—The station is just at extreme high-water mark on a point between a fresh-water creek and a gravel sand beach. It is marked by a framework 16 by 22 inches in cross section, filled with stones.

Burroughs Bay, Unuk River, 1893.—The station is on the hillside 31 feet above and 193.6 feet south of east of the west gable of the astronomical observatory. It is marked by a cross cut in the solid rock and a small pile of stones above it.

Port McArthur, 1886.—The station is on a small island to the right of the entrance to Port McArthur. It is on the north edge of the knoll at the center of the island, and is marked by a framework of scantling filled with stones, which was used as an observing pier.

Shakan Village, 1886.—The station is on a small island about halfway between the sawmill and Klawak Passage. A true north and south line through the station passes very near the center of the front face of the sawmill. A framework of scantling filled with stones was used as an observing pier, and was left to mark the station.

ALASKA—Continued.

Shakan Island, 1886.—The station is on the east side of the small outside island, at the south side of the entrance to Shakan Harbor. It is at the head of a sand and broken shell beach and is marked by a framework of scantling filled with stones, which was used as an observing pier.

Red Bay, Sumner Strait, 1886.—The station is on the west end of East Island, on a small rocky knoll. It is marked by a framework made of scantling and filled with stones, which was used as an observing pier.

Wrangell North Base, 1886.—The station is on an outlying slate ledge about 200 meters northwest of Graveyard Point and is marked by a pier built of flat stones cemented together with plaster of paris.

Wrangell, 1893.—The station is the center of the post in the southwest portion of the Catholic church inclosure. It is 53.82 meters north and 187.48 meters east of the center of the brick astronomical pier (1893).

Duncan Canal, 1887.—The station is on the western shore of Duncan Canal, opposite the mouth of Beecher Pass, on the western end of a small high-water island.

St. George Island, 1897.—The station is in the meridian of the astronomical station (1897) 102.7 feet south of it. It is 56.9 feet from the southwest corner of the company's barn and 64 feet from the southwest corner of the Sailors' Home (a small cottage). It is marked by a drill hole in an irregular lava bowlder about 12 by 6 inches, set in the sod on a slight ridge.

Point Agassiz, Frederick Sound, 1887.—The station is near high-water mark on a sand spit about 100 yards south of the mouth of the first stream south of Point Agassiz. It is the south end of the base line and is marked by a pile of stones. It is 14 feet 5 inches southeast of the pier marking the astronomical station.

Portage Bay, Frederick Sound, 1887.—No description.

Sitka Magnetic Observatory, 1901.—The station is the magnetometer pier in the absolute observatory.

St. Paul Island, 1897.—The station is at the edge of the flat east of St. Paul village 46 and 55.4 feet respectively from the northwest and northeast corners of the billiard house. It is marked by a three-fourths-inch drill hole in a rough rock about 1 foot in diameter, whose surface rises slightly above the surrounding sod. Village Hill geodetic station bears 44° 53′.8 west of true north.

Woewodski Harbor, 1889.—No description.

Cape Fanshaw, 1887.—The astronomical station is marked by a stone pier. The magnetic station is farther from the shore, near the woods.

Cleveland Passage, 1889.—The station is at high-water mark on the low gravel beach in Fanshaw Bay and is marked by a cross chipped in a granite bowlder. It is the south end of the base line. A tree was blazed as a witness mark.

Poke, Point Gambier, 1889.—The station is on the rocky point of a small high-water island and is marked by a cross chipped in the rock. A tree was blazed as a witness mark.

Killisnoo, 1900.—The station is in the path about 12 paces north of a partly demolished observing pier over which stood a dilapidated signal. To reach the place, follow the trail through the graveyard to the south side of the island.

Clot, Sandford Cove, 1889.—The station is at high-water mark at the end of a long, narrow point extending northward and separating Sandford Cove from Endicott Arm, Holkham Bay.

Kodiak Island, 1896.—The station is the astronomical station of 1867 at Shahafka (Chagafka Cove.)

Icy Strait, First, 1901.—The magnetic station is about 5 meters from the triangulation station, on the line to Peach, which bears 21° 22′.2 east of north. It is on the first point to the westward of Spasskaia Bay, at the edge of the tree line just above the driftwood. The triangulation station is marked by a drill hole in a small pyramid-shaped granite bowlder about 2½ by 1½ feet, projecting 8 inches above ground. A small cairn was built over this bowlder.

Icy Strait, Peach, 1901.—The station is on the highest part of the rocky islet to the southward of Point Couverden. It is marked by a shaft of rock about 2½ feet long and projecting about 8 inches above the surface. The upper face is about 12 by 6 inches and has a drill hole in it to mark the exact point.

ALASKA—Continued.

Auke Point, 1890.—The station is on the beach about 75 meters from the end of the point and 52.8 meters southwest of the astronomical station.

Hat, Taku River, 1893.—The station is on Bishop Point, 10.3 meters from a large spruce tree, blazed in several places, and is marked by a drill hole in an irregular stone about 14 by 18 by 8 inches.

Cross Sound, Spence, 1901.—The magnetic station is about 25 meters from the triangulation station in line to Eve, which bears 62° 34′.6 east of true north. The triangulation station is on the highest part of the high grass-covered rock of Cape Spencer. The grass and earth were dug away for a space about 4 feet square, and a hole drilled in the solid rock to mark the station. Some loose stones were carried up to stay the tripod legs, and will serve as witness marks.

Cross Sound, Jog, 1901.—The station is near the edge of a low, rocky ledge, on the south shore of Cross Sound. The lower part of the ledge is of white granite at about high-water mark and dark gray to a height of about 10 feet above high-water mark. The station is on the edge of the timber line, and is marked by a drill hole in the top of a pyramidal-shaped gray granite bowlder, which crops through the surface about 1 foot high and 3 by 5 feet across the top.

Cross Sound, Lack, 1901.—The magnetic station is on a stony beach 10 meters from the triangulation station in the line to Yak, which bears 5° 36′.5 east of north. The triangulation station is on a low, shelving point on the south shore of Cross Sound, about 5 yards above high-water mark. It is marked by a drill hole in a flat rock 2.3 by 1.8 feet, which was set flush with the surface of the ground. Another flat rock was set 14.9 feet to the southwest as a witness mark.

Funter Bay, 1890.—The station is on a flat shelf on Station Island and is marked by the observing pier.

Juneau, 1900.—The station is on the side of the hill east of the town, in the center of a large spruce stump about 6 feet in diameter. The mark or range used was the flagstaff on Captain Campbell's house and bears 8° 44′.0 west of true south.

Dundas Bay, 1900.—Observations were made on the beach about 50 paces south of the Indian huts in the first sheltered cove south of the cannery. To reach the place pass through the cannery and follow the trail leading up the hill and through the woods on the left.

Icy Strait, Gus, 1901.—The magnetic station is about 10 meters from the triangulation station in the line to Boss, which bears 67° 38′.7 east of south. The triangulation station is on the high land of Point Gustavus about 300 meters from the beach. It is marked by a 10-inch stump projecting about 14 inches above ground with a spike in its center.

Point Lena, Lynn Canal, 1890.—The magnetic station is about 40 meters south of the astronomical station, which is on a rock shelf on the west side of Point Lena.

Taku River, Astronomical Station, 1893.—The station is on a small island in Taku Inlet about 200 feet north of the astronomical station, slightly east of the meridian of the astronomical station.

Taku River, Island, 1893.—The station is on a small island near the south bank of the river. It is between two rocks 22.7 feet apart. The distance from the upper rock, which was marked by a drill hole, to the station is 11.8 feet. The lower rock has a cross cut on it.

Taku River, Duck, 1893.—The station is on the first small projection below an old abandoned Indian village. It bears north 22° 30′ east from island.

Taku River, Terrace, 1893.—The station is on the south bank of the river, just where the river makes a bend toward the north. It is on a small projection. Just below the river breaks into numerous channels which wind their way through the many islands.

Taku River, Islet, 1893.—The station is in the center of a small rocky island which bears due west from the first large glacier on the east bank of the river.

Taku River, Fishery, 1893.—The station is on the west side of a large island in midstream. An old Indian village is on this island. The station bears south 50° west from the southwest corner of the first house, and is 26½ meters from it.

Taku River, Wood, 1893.—The station is on the west side of the first large island north of Fishery Island.

Taku River, Lean, 1893.—The station is located on a little knoll on the west bank of the river. A small bayou empties into the river below this point. The south bank of the bayou at its mouth is very rocky.

ALASKA—Continued.

Taku River, Nob, 1893.—The station is on the north side of the river on a prominent projection.

Taku River, Shoal, 1893.—The station was located on a sand bar and can not be recovered.

Taku River, East, 1893.—The station is on a small sand knoll on an island which is partially wooded. The south end of the island is very sandy.

La Perouse, Lituya Bay, 1894.—The station is about 350 meters west of the astronomical station of 1874, on a little hillock at the west end of the spit separating the waters of Lituya Bay from the Pacific.

Camp Muir, Glacier Bay, 1890.—No description.

Anchorage Point, Chilkat Inlet, 1894.—The station is in the edge of the woods on Anchorage Point, a few meters west of "Camp" geodetic station, and in the prolongation of the line from "Cur" geodetic station.

Chilkat, 1890.—The magnetic station is on the southwest extremity of Pyramid Island, near high-water mark.

Chilkoot, 1890.—The astronomical station is on a flat ledge 5 feet above high water and 3 meters from the edge. It is on a point about a quarter of a mile above a deep bay on the west side of the inlet. The magnetic station is about 40 meters west of the astronomical station.

Dalton, 1894.—The station is the triangulation station on the sand bar just clear of the timber at the north end of the narrows in the Chilkat River.

Open, Chilkat River, 1894.—The station is on a small sand dune on the west side of the Indian Channel (used in going up) and just after leaving the narrows. It is marked by a cottonwood post.

Sight, 1894.—The station is in a gravel desert south of Koh-Klux geodetic station.

Koh-Klux, 1894.—The station is 30 meters from Koh-Klux geodetic station in the line to "Sight" geodetic station. It is about 25 yards northwest of a row of Indian graves.

Upper, Chilkat River, 1900.—The station is near the mouth of the Salmon River and on the west bank of Chilkat River, about 100 feet from the high bank of the latter and 400 feet north of the high bank (brush line) of the former and 4 feet north of the largest cottonwood tree in the vicinity. It is marked by a small cairn of stones.

Porcupine, Boundary Camp, 1900.—The station is on the south bank of Klehini River, 2 miles west of the town, and about 1 200 meters west of the point where the provisional boundary line leaves the river just west of Porcupine Creek. It is about 3 meters from the river bank brush line and 50 meters east of a small eroded bluff, which is the first on the south side of the river above Porcupine Creek, and 5 and 8 feet, respectively, from two cottonwood trees, 14 inches in diameter, to the south. It is marked by a small cairn of stones.

Limber, Taiya River, 1894.—No description.

Ocean Cape, Yakutat Bay, 1892.—The station is reached by way of the Aukon River, turning to the right after passing the first island above its mouth and landing at a point where some small rapids will be noticed at low tide, and where the lagoon seems to turn back toward Cape Carrew. From this point a blazed trail leads to the station hill.

Yakutat Bay, 1892.—The station is on Khantaak Island in Yakutat Bay, 56.96 meters from the center of the astronomical pier (1892). The magnetic station bears 11° 55′.7 west of true north from the astronomical pier.

Malaspina, Southwest Base, 1894.—The station is on a sand levee which intervenes between the waters of Yakutat Bay and the thick spruce forest extending along the edge of the glacier toward the Osar River. It is marked by a granite block about 6 inches square on top, and lettered U. S. S. B.

Malaspina, Northeast Base, 1892.—The station is on a small sand knoll, about 15 feet in diameter at the top, which rises about 3 feet above the surrounding plain. It is almost at the mouth of the Forney River, and is marked by a granite post about 6 inches square on top, and lettered U. S. N. B.

Mount Hoorts, Yakutat Bay, 1892.—The station is on top of a mountain whose front slope ends in a small rocky bluff which forms the upper edge of a small bay abreast of the upper edge of Knight Island. A tripod signal was left standing.

Yahtse, East Base, 1894.—The station is on the highest part of the sandy plateau abreast of the western end of a narrow clump of trees, the first encountered on the right bank of the Yana (Yahna) River. A large tripod signal was left standing to mark the spot.

ALASKA—Continued.

Kokinhenic Island (*Copper River Delta*), *1898.*—The station is 23 feet north of the Kokinhenic astronomical station, which is about 300 meters south of the bunk house belonging to the abandoned cannery of the Pacific Steam Whaling Company. The astronomical station is on the summit of the sand ridge near the center of the island. It is marked by a pier of sand and stone with a copper bolt.

Mag, *1900.*—The station is on an outlying rock of an islet at the entrance of the lagoon in the north shore of Hinchinbrook Island, about 4 miles from its northeast tip. The rock is flat and moss covered and has a few small spruce on it. The station is near the northern tip of the rock, about 9 feet from the north and west edges.

Reef, *1900.*—The station is located on the largest rock off the north shore of Hawkins Island, about a quarter of a mile west of the mouth of Windy Bay. It is marked by a copper bolt leaded into the rock.

Orca, *1900.*—The astronomical station is on the beach near the Pacific Steam Whaling Company's cannery at Orca Station, Cordova Bay. It is behind a natural dike of shingle and is awash at extreme high water. It is marked by a concrete pier, 18 by 24 inches on top, and extending about 2½ feet above the surface of the ground. The magnetic station is nearly due west 89.5 feet.

Kun, *1899.*—The station is on marshy land on the south bank of the Kun River, about 1 mile above its mouth. It is 35.5 meters from Kun astronomical station, in prolongation of the line from Cairn Peak. Kun astronomical station is 3.55 meters north of the center of a wooden transit tripod.

Bright, *1899.*—The station is on the west bank of the Yukon River in the Great Bend.

Black (*Kripniyuk*), *1898.*—The station is in the Eskimo village called Kipniak (Kripniyukamut), at the junction of Kripniyagok and Black (Kripniyuk) rivers. It is 72 meters due south of Black (Kripniyuk) astronomical station and 75 meters due south of "Tent" geodetic station. It is marked by a wooden stub. "Tent" geodetic station is 16 meters from the bank of Black (Kripniyuk) River and 23 meters from an octagonal Eskimo log house.

Kwiklokchun, *1898.*—The station is on the east bank of Kwiklokchun channel of the Yukon River, a little below where it leaves the Kusiloak channel, near the mouth of the latter. It is 295.5 meters due south of Kwiklokchun astronomical station and 265.5 meters due south of "Camp" geodetic station. It is marked by a wooden stub.

Head of Apoon, *1899.*—The station is on the east bank of the Apoon Pass of the Yukon River, where it leaves the Kwikpak Pass, in the line of the geodetic stations "Camp" and "Both," 14.26 meters from the former. It is marked by a wooden stub.

Okweah, *1899.*—The station is at the mouth of the Kawanak River in the Yukon Delta, on the south bank, in the line between the geodetic stations "Okweah" and "Skull," about 8 meters from the former and 2 meters from the edge of the bank, which is 2 feet above the water line. It is marked by a wooden peg.

Quit, *1899.*—The station is on the east bank of the Apoon Pass of the Yukon River, near Kotlik, about 6 feet above the water line and 5 feet from the edge.

Pastoliak, *1898.*—The station is on the north point of land at the mouth of the Pastoliak River. It is marked by a stone 1 foot square and 2½ inches thick, with hole drilled in center.

St. Michael, *1898.*—The station is 232.3 and 214.7 meters, respectively, north and west of the astronomical station (1891) and 72.3 and 123.2 meters, respectively, from the northwest corner of the sheet-iron powder house and the southwest corner of the A. C. Company's eating house. It is marked by a wooden stub, on each side of which is placed a stone. The mark or range used was the pipe on the A. C. Company's general store, and bears 28° 11′.1 east of true south.

St. Michael, *1900.*—The station is on the level ground at the bottom of the gentle slope due south of the astronomical station, and was marked by a wooden stake.

Camp Davidson, *Yukon River*, *1891.*—The station is on the Yukon River, near the international boundary. Observations were made in a small log house.

Current, *1900.*—The station is the Hydrographic Signal on the east end of the Imuruk, Port Clarence.

Port Clarence, *1900.*—The station is near the extreme end of the long sand spit on the south side of the entrance to Port Clarence from Bering Sea, close to the astronomical and geodetic stations. It was marked by a wooden stub about 5 inches in diameter, sunk flush with the surface of the ground, and a post 4 inches square and 6 feet long erected over it.

ALASKA—Continued.

Shamansville, 1891.—No description.

Fort Yukon, 1890.—The station is on the river bank near old Fort Yukon.

Camp Colonna, Porcupine River, 1890.—The station is at the base of Mag Hill, Camp Colonna, near the international boundary, about 600 feet from the Porcupine River. A log house 7 feet square was built and used as an observatory.

Valley of Three Rivers, 1890.—No description.

Uglaamie, near Point Barrow, 1883.—The station is the magnetic and meteorological station of the United States Polar Expedition at Uglaamie. It is about 10½ miles to the southward and westward of Point Barrow and 150 meters from shore.

ARIZONA.

Pima County, Nogales, 1892.—The station is in the southern part of the public-school grounds on the bench on the west side of the valley in which the town is situated. It is nearly south of the center of the schoolhouse, being about 72 feet from the southwest corner and 71 feet from the southeast corner, and is in the line from the southeast corner of the schoolhouse to the extreme west point of the ridge of the church just northeast of the schoolhouse.

Yuma County, Yuma, 1892.—The station is in the middle of a large adobe corral south of the longitude station, which is on the north side of the corral. The station is set in the meridian of the transit, 32.84 meters south of it. It is marked by a 3 by 4 by 24 inch pine stub, set so as to leave about 2 inches projecting above the surface of the ground.

ARKANSAS.

Clay County, Corning, 1901.—The station is northeast of the town in the cemetery, 101.5 feet north of the south fence. A meridian line was established, the station being the north end of the line. This line is marked by stone posts, and is 723.6 feet long. The south stone is in a field belonging to Mr. Polk, and is at the fence along the road. The mark or range used was the eastern edge of Mr. Johnson's house, and bears 41° 04′.4 west of true south.

Craighead County, Jonesboro, 1901.—The station is just south of the town, at the end of Main street, on land of Mr. Warner. A meridian line was established; the north end is just at the fence, the south end is on the hill. The line is marked by stone posts 8 inches square, projecting 4 inches above the surface of the ground. The south stone was used as the magnetic station. The mark or range used was the eastern edge of a large iron stand pipe, and bears 0° 11′.2 east of true north.

Drew County, Monticello, 1901.—The station is on the south side of Bowling avenue, on the grounds of Mrs. Bowling, about 1 mile from the court-house and one-quarter mile from Main street. It is 220 feet from the fence to the east, and about 250 feet from the road to the north. It is marked by an oak post 4 inches in diameter. The mark or range used was the edge of a small house, distant about 1 mile, and bears 49° 54′.7 east of true north.

Green County, Paragould, 1901.—The station is about 2 miles from town on the county road. A meridian line was established, the north end being the magnetic station. This line is marked by stone posts 8 inches square. The north stone is 83.0 feet ast of a fence, and is 755.7 feet north of the south stone, which is near the fence along the public road. The mark or range used was the gable end of Mr. J. M. Agee's house, and bears 0° 13′.8 west of true north.

Hot Spring County, Malvern, 1901.—The station is about 1 mile south of the town in the grounds of Mr. MacHenry, on Main street. It is marked by a stone post 8 inches square, set so as to leave 2 inches projecting above the surface of the ground. The mark or range was the peak of the roof of a house, and bears 16° 12′.4 east of true north.

Independence County, Batesville, 1901.—The station is on the grounds of the Arkansas Presbyterian College. A meridian line was established, the south end being used as the magnetic station. This line is marked by stone posts 8 inches square, projecting 4 inches above the surface of the ground. The south stone is west of College Hall, 60 feet north of Boswell street, and 53.8 feet east of the west fence. The distance between the stones is 286.8 feet. The mark or range used was the square support for the vane on a house, and bears 1° 28′.7 east of true north.

Jackson County, Newport, 1901.—The station is about 1½ miles from town, on the United States

ARKANSAS—Continued.

Experimental Station grounds. A meridian line was established, the south end being used as the magnetic station. The line is marked with stone posts 8 inches square, and is 859.65 feet long. The south stone is northeast of Mr. Irby's house, 109.4 feet from the corner. The north stone is in the race track, about 18 inches from the fence on the north side. The mark or range used was the northeastern edge of the molding, just under the roof of the house of Mrs. G. K. Stevens, and bears 23° 52′.4 west of true north.

Jefferson County, Pine Bluff, 1901.—The station is on a large piece of open land on the north side of the road running out to the western part of the town, about 2 miles from the town, on land owned by Mrs. Smart. It is marked by a stone post 7 inches square, set so as to leave 3 inches projecting above the surface of the ground. The mark or range used was the edge of a telegraph pole, and bears 20° 25′.8 west of true south.

Lawrence County, Walnutridge, 1901.—The station is in the court-house grounds. A meridian line was established, the south stone being used as a magnetic station. This line is marked by a stone post 3½ feet by 7 by 7 inches, set so as to leave 3 inches projecting above the surface of the ground. The south stone is west of the court-house, 83.4 feet from the corner. The distance between the stones is 443.75 feet. The mark or range used was the peak of the roof of the Presbyterian church, and bears 70° 32′.2 east of true north.

Ouachita County, Camden, 1901.—The station is about 1 mile west of the town on land owned by Mr. H. G. Smith. It is about 200 feet south of the road to town, the main street, and 71.5 feet west of the east fence of the field. It is marked by a stone sunk so as to leave 3 inches projecting above the surface of the ground. The mark or range used was the peak of the roof of a house, and bears 3° 45′.1 east of true south.

Phillips County, Helena, 1890.—Observations were made over the north stone of the county meridian, in the northeast corner of the court-house square. This stone is 32 feet from the east fence, 43.4 feet from the north fence, and 166 feet from the center of the Transit Pier. The mark or range used was the central rod on cupola of high school, and bears 15° 56′.2 east of true south. The Presbyterian church spire bears 81° 53′.2 east of true south.

Pike County, Murfreesboro, 1901.—The station is about one-half mile due north of the court-house, in the center of a large, open field belonging to Mr. C. A. Kelly. It is marked by a stone post 8 inches square, set so as to leave 3 inches projecting above the surface of the ground. The mark or range used was the western edge of the middle window of the second floor of the court-house, and bears 3° 10′.9 east of true south.

Pulaski Connty, Little Rock, 1896.—The station is in the southeast corner of city park, marked by an oak stub 67.7 meters from east fence (McAlmont street) and 65.3 meters from south fence (Thirteenth street). Mark, a church steeple, bears 70° 26′.6 west of true north.

Pulaski County, Little Rock, 1901.—The station is on the parade grounds of Fort Logan H. Roots, about 3 miles northwest of Little Rock. It is about 700 feet southwest of the west end of the barracks and about 125 feet due east of the drive. It is marked by a gray limestone post 3 feet by 7 by 7 inches, lettered on top U. S. C. & G. S., sunk 3 feet in the ground. A meridian line was established at the time of these observations. The above-described stone marks the north end. The south end is marked by a similar stone set 444.5 feet distant. The mark or range used was the tip of the tower on the Maddox Female Adademy, and bears 4° 29′.5 east of true south.

Sharp County, Evening Shade, 1901.—The station is on the hill just north of the post-office in the grounds of the Baptist church. A meridian line was established. It is marked by stone posts 8 inches square projecting 4 inches above the surface of the ground. The south stone of this line is the magnetic station. The distance between the stones is 639.25 feet. The mark or range used was the gable end of Mr. C. A. Evans's house, and bears 21° 45′.2 east of true south.

White County, Searcy, 1901.—The station is on the east campus of the Spear Langford Military Academy. It is the north stone of the meridian line established at the time of the magnetic observations. The line is marked by stone posts 3½ feet by 7 by 7 inches set 3 feet 3 inches in the ground. The north stone is about 70 feet from the fence on the north and 77 feet from the fence on the east. The distance between the stones is 460 feet. The mark or range used was the tip of the court-house spire, and bears 83° 34′.0 east of true south.

CALIFORNIA.

Alameda County, Altamont, 1897.—Observations were made within a few feet of a gray sandstone rock, 6 feet broad and 9 feet long, projecting 5 feet out of the ground. This rock is lettered on its vertical face U. S. C. & G. S., 1897, with a cross marking the center. It is located about one-fourth of a mile east of the Southern Pacific Railroad station on a place occupied by N. A. Nickerson. It is approximately in the northeast corner of the SW. ¼ of sec. 21, T. 2 S., R. 3 E. (M. D. M.). The azimuth station is on the line joining the center of this rock with the base of the flag pole on the school-house cupola, and is distant 4.5 feet from the center of this rock. The magnetometer station is on the same line, distant 16.8 feet from the center of the rock. The dip station is 50 feet from the magnetometer station, and about east of it. The mark or range used was the base of the flag pole on the school-house cupola. This mark or range from the azimuth station bears 40° 20′.1 west of true north.

Butte County, Oroville, 1897.—Azimuth observations were made over a blue sandstone post, 4 feet long, set 2 feet in the ground, 8 by 8 inches on top with a small hole marking the center. This south meridian stone is lettered on its south vertical face Mag. Sta., on its west face U. S. C. & G. S., and on its east face 1897. It is located on the south bank of the Feather River, near the north end of Second avenue and the west end of Safford street, and is distant 40.5 and 58.3 feet, respectively, from the northeast corner of the lot southwest of it and from the northwest corner of the lot southeast of it. A post similar to the south meridian stone was located 2,000 feet true north of it, on the opposite side of the river near the edge of the bluff. This north meridian stone is lettered on its south vertical face 1897, on its north face U. S. C. & G. S., and on its west face Merd. Mark. The magnetometer station is on the line joining the center of the south meridian stone with the flag pole on the tower of the Odd Fellows' Home when this line is extended 29.5 feet from the center of this stone. The dip station is on the line joining the center of the two meridian stones when this line is extended 70 feet south of the south stone. The mark or range used was the flag pole on the tower of the Odd Fellows' Home. This mark or range from the south meridian stone bears 83° 46′.5 west of true south. The spire of the Congregational church bears 76° 00′.5 east of true south. The weather-vane rod on the public schoolhouse bears 45°28′.7 east of true south.

Calaveras County, Milton, 1897.—Observations were made near a stone rock 10 by 8 by 24 inches, projecting 6 inches out of the ground. The top of this stone is lettered U. S., with a cross marking the center. It was located on the eastern fence line of the Masonic cemetery, 24.7 feet distant from the northeast corner of this cemetery. It is about 1 500 feet east of the Masonic Hall at Milton, in sec. 14, T. 2 N., R. 10 E. (M. D. M.). The azimuth station is on a line joining the center of this stone with the base of the flag pole on the west gable of the Masonic Hall when this line is extended 4.8 feet outside of the cemetery. Magnetometer station is on the same line when it is extended 12.6 feet outside of the cemetery. The dip station is distant 50 feet from the azimuth station and about south of it. The mark or range used was the base of the flag pole on the west gable of the Masonic Hall. This mark or range from the azimuth station bears 67° 35′.7 west of true north. The base of the flag pole on the schoolhouse building bears 70° 32′.2 west of true north.

Colusa County, Colusa, 1898.—Azimuth observations were made over a blue sandstone post 4½ feet long, projecting 2 feet out of the ground, 10 by 10 inches on top, with a cross marking the center. This south meridian stone is lettered on its north vertical face Mag. Sta., on its south face U. S. C. & G. S., and on its east face 1898. It was located on the county road which leads to Williams, and is about 1¼ miles southwest of the county court-house at Colusa. It is also about 6 miles west of the Mount Diablo meridian and about three-fourths of a mile north of the third standard parallel north. It is distant 19 feet north and 4 feet west of the southeast right-angle corner in the county road. A post similar to this south meridian stone was located about 1 440 feet true north of it, 33 feet from a northwest corner in the county road. This north meridian post is lettered on its north vertical face Mer. Mark, on its south face U. S. C. & G. S., and on its east face 1898. The magnetometer station was in the line joining the cross on the Catholic church spire with the center of the south meridian stone when this line is extended 40 feet from the center of the post. The dip station was on the same line extended 90 feet from the post and south of it. The mark or range used was the cross on the spire of the Catholic church. This mark or range from the south meridian stone bears 43° 40′.3 east of true north. The base of the flag pole on the grammar school bears 46° 12′.6 east of true

CALIFORNIA—Continued.

north. The weather-vane rod on the Methodist church spire bears 38° 48′.3 east of true north. The cross on St. Aloysius Convent bears 33° 01′.8 east of true north. The base of the flag pole on Colonel Hager's house bears 20° 30′.3 east of true north.

Colusa County, Snow Mountain, west, 1892.—The station is on the southwest summit of Snow Mountain on the ridge at the highest point. It is marked by a copper bolt in a concrete pier 3 feet 8 inches high.

Contra Costa County, Mount Diablo, 1884.—The station is distant 88.0 feet from the geodetic station in the line of Ross Mountain. The geodetic station is near the summit, which is small and rocky. The highest point is not that chosen by the Coast Survey, but a spot so close beside the highest rock that the signal pole bears against it at its foot. It is marked by a pine post. Ross Mountain bears 57° 22′.5 west of true north.

El Dorado County, Lake Tahoe, 1895.—The station is in the meridian line at the southeast end of Lake Tahoe, near the Lakeside Tavern. It is 25 meters south of "Transit" geodetic station (1893), and is marked by a drill hole in an uncut granite block set for the purpose and roughly squared at the top. The mark or range used was the south meridian stone.

Eldorado County, Placerville, 1897.—Azimuth observations were made over a hewn granite post, 4 feet long, projecting 2 feet out of the ground. The top of this stone is dressed 8 inches square, with a cross marking the center. Its south perpendicular face is lettered U. S. C. & G. S., and its north face Mag. Sta., and its west face 1897. This stone was located a little over one-fourth of a mile south of the county court-house, on the top of the hill southeast of the Chinese quarter. It is southwest of the reservoir, near a mine shaft, and about three-fourths of a mile southeast of the fair grounds. A similar stone to this south meridian stone was located about 1 000 feet true north of it and on the top of a hill across the road. Its south vertical face is lettered U. S. C. & G. S., its east face 1897, and its west face Mer. Mark. The magnetometer station was on the line joining the center of the south meridian post with the flag pole on the judges' stand at the fair grounds when this line is extended 30 feet from this post. The dip station is 70 feet from the magnetometer station and northeast of it. The mark or range was the flag pole on the judges' stand at the fair grounds. This mark or range from the south meridian stone bears 52° 20′.4 west of true north. The flag pole on the Episcopal church bears 38° 35′.4 west of true north. The weather vane on the cupola of the public schoolhouse bears 23° 13′.9 west of true north.

Fresno County, Fresno, 1897.—Observations were made within a few feet of a large cemented brick pier surmounted by a sandstone capstone lettered on its top "Long & Lat. Mark. U. S. Geographical Survey. West of the 100 Meridian. War Dept." This pier is four blocks south of the Southern Pacific Railroad tracks, in the square bounded by D and C, Kern and Ingo streets. The azimuth station is in the line joining the center of this pier with the center of the ball on the county court-house dome and distant 6.5 feet from the center of the pier. The magnetometer station is on this same line when it is extended 8.4 feet south of the center of the pier. The dip station is on a line at right angles to this line and 50 feet southeast from the center of the pier. The mark or range used was the center of the ball on the top of the county court-house dome. This mark or range bears from azimuth station 30° 47′.5 east of true north. The vane of the clock tower of the building at the corner of the street opposite the Grand Central Hotel bears 24° 15′.0 east of true north.

Fresno County, Huron, 1897.—Azimuth observations were made over the center of a pine post, 4 by 4 inches, projecting 2 feet above the ground and lettered U. S. '97 on one of its perpendicular faces. This post was located about 1 300 feet southwest of the Southern Pacific Railroad passenger station, and it marks the southwest corner of the town-site survey of Huron. The line joining the center of this post with the east end of the gable of the belfry on the east end of the schoolhouse, when this line is extended 54 feet from the post, intersects a fence. From this point of intersection to the southwest fence corner of the field in which this post is located is 144 feet. The magnetometer station and the dip station are on the line between the center of the post and the point on the belfry of the schoolhouse, distant 7 and 60 feet, respectively, from the center of the post. The mark or range used was the point on the schoolhouse belfry, as already described. This mark or range from the azimuth station bears 46° 56′.9 west of true north. The top of the ventilator on the passenger station of the Southern Pacific Railroad bears 31° 28′.9 east of true north.

CALIFORNIA—Continued.

Fresno County, Madera, 1897.—Observations were made near a slab of slaty sandstone, 40 by 8 by 3 inches, projecting 20 inches above the surface of the ground, with a cross in its center marking the point. It is lettered on one of its vertical faces U. S. 1897 Mag. Sta. This stone is located in the northeastern part of the cemetery in the northwestern part of the town and about 1 200 feet west of the Southern Pacific Railroad. It is on the edge of the cemetery fence, 250.6 feet from the northeast corner of the cemetery. The azimuth station is in the line joining the center of this stone with the Christian church spire when it is extended 10.7 feet in the cemetery. The magnetometer station is on the same line when extended 30.3 feet in the cemetery. The dip station is 50 feet about south of the azimuth station. The mark or range used was the spire of the Christian church. This mark or range from the azimuth station bears 80° 48′.4 east of south. The base of the flag pole on the high-school cupola bears 13° 38′.4 east of true south. The northeast corner of the cemetery bears 2° 17′.6 east of true north.

Fresno County, Mendota, 1897.—Observations were made within a few feet of a reddish bowlder, 1 by 6 by 6 inches, buried 4 inches below the surface of the ground, with its top lettered U. S., with a cross marking the center. This bowlder is located about 1 000 feet southeast of the Southern Pacific Railroad station. It is also about 500 feet northeast of the center of the SW. ¼ of sec. 31, T. 13 S., R. 15 E. (M. D. M.). It is outside and near the eastern corner of the fence around the schoolhouse grounds, and is also near P street. The azimuth station is on the line joining the center of this bowlder with the southeast gable of the passenger railroad station when this line is extended 12.0 feet from the bowlder. The magnetometer station is on this same line extended 33.2 feet from this bowlder. The dip station is about 40 feet west of the magnetometer station and near the schoolhouse building. The mark or range used was the northeast gable of the passenger station. This mark or range from the azimuth station bears 37° 23′.0 east of north. The ball on the top of the water tank near the railroad roundhouse bears 67° 40′.5 east of true south.

Glenn County, Willows, 1897.—Azimuth observations were made over a granite post 3 feet long, projecting 1 foot out of the ground, 8 by 7 inches on top, with a cross marking the center. This south meridian stone is lettered on its west vertical face 1897, on its south face U. S. C. & G. S., and on its north face Mag. Sta. It was located in the town of Willows 10 feet west of the intersection of the south line of Ash street and the east line of Lassen street. A post similar to this south meridian post was located about 903 feet true north of it, 10 feet north and 4 feet west of the intersection of the south line of Oak street and the east line of Lassen street. This north meridian stone is lettered on its south vertical face U. S. C. & G. S., and on its north face Mer. Mark, and on its west face 1897. The magnetometer station was on the line joining the center of the south meridian stone with the gilded ball on the county court-house dome when this line is extended 15 feet from the center of the stone. The dip station is on the same line 50 feet north of the stone. The mark or range used was the gilded ball on the county court-house dome. This mark or range bears 10° 02′.3 west of true north. The flag pole on the belfry of the public school bears 6° 27′.5 west of true north. The flag pole on the Masonic Hall bears 39° 20′.7 east of true north.

Humboldt County, Cape Mendocino, 1886.—The station is south 30° 50′.6 east of the Cape Mendocino light-house, about 50 feet outside the fence inclosing it and the keeper's dwelling, and is close to and above the road leading from Singley's flat to the light-house. It is marked by a brick sunk in the ground, surrounded by a pile of stones. The mark or range used was the triangulation station "South of Cape," and bears 32° 14′.8 east of true south.

Humboldt County, Mount Lassic, 1892.—The station is on the line Mount Lassic geodetic station—Taylor's Peak geodetic station, distant 23 feet 10 inches from the former. The geodetic station is on the most western and least prominent of the three buttes which rise in sharp conical outlines about 200 feet above the general surface of the mountain. It is marked by a copper bolt in the top of a concrete pier.

Kern County, Asphalto, 1897.—The azimuth observations were made over the center of a stone monument projecting 8 inches out of the ground. On its north perpendicular face a faint cross was cut. This sandstone monument is located about one-half mile north of the Standard Asphalt Works and is at the corner of the NE. ¼ of sec. 27, T. 30 S., R. 22 E., Mount Diablo meridian. It is near a creek. The magnetometer observations were made between the monument and this creek, on

CALIFORNIA—Continued.

the line joining the center of the monument with the flag pole on the end of the east gable of the superintendent's house and office. It is distant 7 feet from the center of the monument. The dip station is on a line at right angles to this line, 60 feet from the center of the monument and westward of it. The mark or range used was the base of the flag pole on the house and office of the superintendent of the asphalt works, on the end of the east gable. This mark or range from the monument bears 52° 49′.8 west of true south. The center of the door and the east edge of the ventilator on the cook-house cellar bear 28° 08′.6 west of true south.

Kern County, Caliente, 1897.—The azimuth observations were made over a granite bowlder 8 by 12 by 18 inches, projecting about 6 inches above the surface of the ground. The top of the stone is lettered U. S., with a cross marking the center. This bowlder was located about 1 000 feet east of the Southern Pacific Railroad station, east of the county road and 189.2 feet south and east of the southwest corner of a field north and west of this bowlder. A line joining the center of this bowlder and the bottom of the flag pole on the schoolhouse, when this line is extended 90 feet, passes through the northern end of a bridge crossing a creek near the station. The magnetometer station was in this same line 83 feet from the northern end of this bridge, or 81 feet from the stone. The dip station is in the line to the northeast gable of the Southern Pacific Railroad station when it is extended 50 feet eastward from this bowlder. The mark or range used was the base of the flag pole on the schoolhouse. This mark or range from the azimuth station bears 36° 41′.4 east of true north. The northeast gable of the Southern Pacific Railroad station bears 68° 00′.6 west of true north. The top of the roof of the railway water tank bears 52° 18′.4 west of true north.

Kern County, Delano, 1897.—The azimuth observations were made over a redwood post 4 by 4 inches square, 5½ feet long, set 2 feet in the ground. On one of its perpendicular faces is cut U. S. C. & G. S., on another 1897, and on a third Mag. Sta. This post was located in the northwestern part of the town, about 1 000 feet west of the Southern Pacific Railroad, in the western corner of the inclosure around the brick schoolhouse. It is 35.4 feet southeast of the western corner, measured along the fence line of the schoolhouse grounds, and 3.2 feet from the southwestern fence line in the line joining the center of this post with the Methodist church spire. The magnetometer station was in this same line 9 feet from the post in the direction of the Methodist church spire. The dip station was also in this line distant 50 feet from the post in the same direction. The mark or range used was the cross on the Methodist church belfry. This mark or range from the center of the post bears 74° 09′.5 east of true north. The base of the flag pole on the Central Hotel bears 52° 34′.5 east of true south.

Kern County, Mojave, 1897.—The azimuth observations were made over the center of a post 4 feet long, set 1½ feet in the ground. The letters U. S. are cut in this post. It was located on the desert one-half mile northeast of the Southern Pacific Railroad station, outside of the cemetery, in line with the west fence of the cemetery, and is distant 15 feet from its southwest corner. The dip station is also in line with the west fence of the cemetery, and is distant 70 feet from its southwest corner. The magnetometer station is in the line joining the center of this post with the cupola of the railroad station when this line is extended 12 feet. The mark or range used was the tip of the cupola on the Southern Pacific Railroad passenger station. This mark or range from the center of the post bears 52° 40′.4 west of true south. The northwest gable of the Southern Pacific Railroad passenger station bears 54° 11′.4 west of true south. The north gable of the schoolhouse bears 62° 48′.4 west of true south. The direction of the west fence of the cemetery bears 9° 45′.4 west of true north.

Los Angeles County, Los Angeles, Magnetic Observatory, 1889.—The station is in the grounds of the Branch Normal School, at the foot of the slope, almost due west, about 200 feet from the nearest wall of the school building. It is identical with that used for absolute measures in connection with the magnetic observatory.

Los Angeles County, Los Angeles, 1892.—The station is in the Elysian Park, north of the city. It is marked by the drill hole in the center of the southern corner stone of the park, a stone 7 inches square and broken off a few inches above the ground. It is on the top of the ridge north of Reservoir road and nearly in line with the west side of Douglas street (extended). The Normal School flagstaff bears 6° 54′.3 west of true south.

Los Angeles County, Los Angeles, Northwest Base, 1890.—The station is on the line Northwest Base-Southeast Base. The Northwest Base is on the rising ground, about 1½ miles from the little

CALIFORNIA—Continued.

village of Norwalk, on the Southern Pacific Railroad. It is in the midst of a grove of eucalyptus trees about 200 yards east of the Southern California Railroad on land belonging to Mr. J. B. Nichols. The mark or range used was Southeast Base and bears 37° 26′.8 east of true south.

Los Angeles County, Los Angeles, Southeast Base, 1890.—The station is nearly in line Southeast Base-Northwest Base, distant 101.95 feet from Southeast Base. Southeast Base is about 100 yards west of the main road from Anaheim to Gardengrove, about 3 miles from the former and 1 mile from the latter place. It is on land belonging to Mr. R. K. Sherman, about halfway between his house and barn. Southeast Base bears 33° 50′.1 east of true south.

Los Angeles County, North Pomona, 1897.—Observations were made over a bowlder set 20 inches below the surface of the ground, with a small hole in its top marking the center. Immediately over this bowlder was set another bowlder about 18 inches long and 6 or 7 inches in diameter, projecting about 3 inches above the ground, and lettered on its top U. S., with a small hole marking the center. These bowlders were located about one-fourth of a mile northeast from the railway station, and 100 meters north of the east gable of the most eastern large packing house north of the railway. A large tree, nearly a mile east of this bowlder, is in line with the left summit of the high ridge on the right of the highest summit of the mountains to the east, known as San Bernardino Mountains. The high peak on the left is known as Gray Back, and the right summit on the ridge as San Bernardino Peak. There are two rows of apricot trees just north of this magnetic station in the orange orchard. The magnetic station is in line with the eastern row of trees. The mark or range used was the flag pole on the cupola of the Claremont schoolhouse. This mark or range bears 75° 03′.2 east of true north. The central rod of a windmill at the foot of a mountain, near a white house, bears 36° 05′.4 east of true north. Gray Back Peak bears 87° 31′.4 east of true north.

Los Angeles County, Palmdale, 1897.—Observations were made over a stone post 10 by 10 by 5 inches, buried 1½ feet below the surface of the ground, with its top lettered U. S., and with a cross marking the center. This stone was located about 850 feet northeast of the Southern Pacific Railroad passenger station. It is distant 18 feet south and 25 feet east of the northwest corner of Center street and Almond avenue. The dip station is 50 feet north of this street corner, on the western edge of Almond avenue. The mark or range used was the northwest gable of the passenger station of the Southern Pacific Railroad. This mark or range bears from the stone 68° 03′.0 west of true south. The perpendicular face of the southeast corner of Sherer's brick store bears 59° 58′.0 west of true north. The windmill rod bears 46° 50′.0 west of true north.

Los Angeles County, San Pedro, 1897.—Observations were made over a stone about 2 feet long, with its upper surface projecting 2 inches out of the ground. It has a rounded top 14 by 8 inches, roughly lettered U. S., with a small hole marking the center. This stone was located on the west side of the park, which is on the bluff fronting the harbor. It was placed in the line of trees bordering the west side of the park, and midway between two trees opposite the center of Ninth street, which is perpendicular to Beacon street, the street bordering the park on the west. This stone is about 50 meters on a line 14° 30′ east of south of the small pavilion in the center of this park. The mark or range used was the hydrographic signal on Deadmans Island. This mark or range bears 39° 33′.6 east of true south. The Catholic Church spire bears 88° 06′.9 west of true south. The flag pole on the schoolhouse bears 42° 58′.6 west of true north. The bell tower on the Methodist Church spire bears 29° 46′.6 west of true north. The smokestack on the sawmill bears 39° 27′.4 east of true north.

Los Angeles County, Santa Monica, 1897.—Observations were made over a concrete post 2 feet long, set even with the surface of the ground, 10 by 10 inches on top, and lettered U. S. with a small hole marking the center. This post was located in the park along the ocean front, called Ocean Park or Linda Vista. It is in the northeast side of the park, about 5 feet inside of the southwest curb line along Ocean avenue, and about 5 feet northwest of the line of the northwest curb on Washington avenue when it is extended. Ocean avenue extends northwest and southeast, and Washington avenue is at right angles to it. This concrete post is 2 feet inside of the line of palmettoes which border Ocean avenue. About 100 feet southwest of this magnetic station is a bluff nearly 100 feet high. At the foot of this bluff is the ocean beach and the Southern Pacific Railroad to Los Angeles. The mark or range used was the left-hand flag pole on the bath house on the beach to the southeast. This mark or range bears 38° 38′.7 east of true south. The extreme point of the mainland to the south bears

CALIFORNIA—Continued.

14° 33′.2 east of true south. The extreme point of the mainland to the west bears 85° 43′.5 west of true south. The highest peak to the northwest, on the ridge to the right of apparently the highest peak, bears 61° 00′.7 west of true north. The highest peak to the north, over the center of a house one-half block away, bears 23° 46′.2 west of true north. The peak in the northeast, the first to the left of highest one visible, bears 55° 32′.5 east of true north. The flag pole on a house halfway between California and Washington avenues, on Third street, bears 68° 09′.8 east of true north.

Los Angeles County, Saugus, 1897.—Observations were made over an irregular bowlder 5 by 9 by 17 inches, projecting 5 inches above the ground, lettered on top with a U. S., and with a cross marking the center. This stone was located in an open field at the foot of a steep hill, about 800 feet in a northeasterly direction from the passenger station of the Southern Pacific Railroad. The azimuth station was in the center of this bowlder. The magnetometer station was in the line joining the center of the bowlder with the point of the cupola on the passenger station, when this line is extended 8 feet. The dip station was on a line at right angles to this line through the azimuth station and 50 feet toward the west. The mark or range used was the tip of the cupola of the passenger station of the Southern Pacific Railroad Company. This mark or range from the bowlder bears 50° 33′.8 west of true south. The center of the trunk of a double oak tree, distant 211 feet from the azimuth station, bears 57° 26′.2 east of true south. The center of the trunk of an oak tree, distant 98 feet from this double oak, bears 66° 47′.2 east of true south.

Marin County, San Rafael, 1897.—Observations were made over a marble post 4 feet long, set 2 feet in the ground, 8 by 8 inches on top, with the center of a cross marking the point. This post is lettered U. S. C. & G. S. on its west vertical face, MAG. STA. on its south face, and 1897 on its east face. This post was located 1.1 miles northwestward from the county court-house. It is near the top of a hill (on the eastern slope) on which is located one of the water company's reservoirs, and it is distant about 375 feet eastward from this reservoir. The azimuth station was over the center of this post. The magnetometer station was in the line joining the center of this post with the flag pole on the county court-house, when this line is extended about 10 feet from the post. The dip station is about 50 feet from the post and east of it. A similar marble post was set about 700 meters true south of the north stone. The north vertical face of the south stone is lettered MER. MARK., the east face U. S. C. & G. S., and the west face 1897. The mark or range used was the flag pole on the court-house building. This mark or range from the center of the north stone bears 70° 13′.8 east of true south. The tripod signal on the Point San Quentin bears 54° 55′.8 east of true south. The flag pole on the east peak of Mount Tamalpais bears 61° 21′.6 east of true south. The tripod signal on Red Rock Island bears 26° 54′.9 west of true south.

Mendocino County, Cold Spring, 1891.—The station is situated on a large rock or bowlder, about 20 feet in diameter at the base and about 15 feet higher than the surrounding ridge. It is locally known as "Signal Ridge." It is marked by a concrete pier 26 inches square, in the top of which is inserted a copper bolt. This pier is about 4 feet high.

Mendocino County, Point Arena, 1889.—The station is almost due east 98.6 feet from the transit pier. This pier is about 200 meters east of the main street of the town, upon the hill where the two large water tanks stand. It is 26 feet east of the single tank and 49 feet south of a barn. The cross on the Catholic church steeple bears 50° 01′.8 west of true north.

Mendocino County, Ukiah, 1897.—Azimuth observations were made over the center of a smooth white marble post 4 feet long, set 2 feet in the ground, 8 by 8 inches on top, with a cross marking the center. The south perpendicular face of this post is lettered U. S. C. & G. S., the east face MAG. STA., and the north face 1897. This marble post is located on the western side of the level Russian River Valley, one-half mile east of the base of the mountains and three-fourths of a mile west of the San Francisco and Pacific Coast Railroad. It is 116 meters true west and 1786 meters true south of the county court-house, as scaled from a road-survey map. It is one square west from the county road, in the southeast corner of a square, 49 and 50 feet, respectively, from the southern and eastern street lines of this square, and near a creek which is dry in the summer. A similar marble post was located on the eastern edge of the street, 250 paces true north of this south meridian stone. This north stone is lettered on its west perpendicular face MER., on its south face 1897, and its north face U. S. C. & G. S. The magnetometer station is in the line joining the center of the south meridian stone and the flag

CALIFORNIA—Continued.

pole on the county court-house, when this line is extended 31 feet from the stone. The dip station is about 50 feet west of the south meridian stone. The mark or range used was the flag pole on the court-house. This mark or range from the center of the south stone bears 3° 48′.8 east of true north.

Merced County, Merced, 1897.—Observations were made near a cross on the northeast corner of the brick wall surrounding the Catholic Cemetery, where it is lettered U. S., 1897. This cemetery is about 1½ miles south of the county court-house. The azimuth station is 15.3 feet east of the northeast corner of this cemetery, in line with the northern edge of the wall extended. The magnetometer station was on the line joining the center of the azimuth station with the top of the head of the statue on the court-house when this line is extended 14 feet from the azimuth station. The dip station was 50 feet east of the azimuth station in the line of the northern wall of the cemetery. The mark or range used was the top of the head of the statue on the court-house. This mark or range from the azimuth station bears 4° 25′.2 east of true north. The Methodist church spire bears 6° 52′.2 east of true north. The direction of the northern wall of the cemetery bears 89° 24′.8 west of true north.

Merced County, Volta, 1897.—Observations were made within a few feet of the center of a redwood post 5 feet long, 4 by 6 inches on top, projecting 3 feet above the ground. One of the perpendicular faces of the post is lettered U. S., another 1897, and another MAG. STA. This post was located about one-fourth of a mile northeast of the Southern Pacific Railroad station, about 31 feet south and 57½ feet east of the northwest corner of T. 10 S., R. 10 E. (M. D. M.) It is on the fence line, 27.5 feet from the northwest corner of the field in which it is located. The azimuth station is on the line joining the center of this post with the cross on the Catholic church, and distant 24.5 feet from the center of the post. The magnetometer station is on the same line and distant 17.7 from the center of the post. The dip station is 50 feet southeast of the magnetometer station. The mark or range used was the cross on the Catholic church spire. This mark or range from the azimuth station bears 31° 19′.0 west of true south. The flag pole on the cupola of the Volta Hotel bears 34° 03′.5 west of true south. The northwest fence corner of the field bears 34° 49′.0 west of true north.

Monterey County, Bradley, 1896.—Observations were made over the center of a 7 by 7 inch pine post 5 feet long, set 2½ feet in the ground. This post is lettered on its face U. S. and 1896. It was located on the west line of the main street of the town, near the edge of the bluff overlooking the valley of Salinas River. It is distant about one-fourth of a mile from the passenger station of the Southern Pacific Railroad, in a southwesterly direction. This post is distant 187.5 feet from the northwest corner of the streets north and east of it. The street north of it is 60 feet wide, and the street immediately east of it (the main street of the town) is 82 feet wide. The azimuth observations were made over this post; the dip and magnetic observations in the line joining the center of this post with the belfry on the schoolhouse, distant 50 and 26 feet, respectively, from it. The mark or range used was the belfry on the schoolhouse tower. This mark or range bears from the azimuth station 66° 00′.0 west of true north. The south gable of the high part of the passenger station bears 44° 28′.5 east of true north. The west line of the main street bears 18° 15′.0 east of true north.

Monterey County, Monterey, 1896.—The station is on the hill on which is situated the old fort, of which but little remains, southwest of the ruins. It is marked underground only by a bottle. The mark or range used was the flagstaff on the west gable end of the Del Monte bath house, and bears 64° 25′.5 east of true south.

Monterey County, Mount Toro, 1885.—The station is in the line Mount Toro geodetic station–Santa Lucia geodetic station, distant from the former 34 meters. The geodetic station is located upon the smooth grassy hill about 500 yards south of Mr. A. B. Parson's house, not far from Salinas City. It is marked by a copper bolt in a concrete pier.

Monterey County, Salinas, 1896.—Azimuth observations were made over a hewn granite stone 16 inches long, set 14 inches in the ground, 8 by 8 inches on top, with a small hole marking the center, and this stone is lettered U. S. This stone was located in the northern part of the town, at what is now the head of Natividad street. It is distant about 3,450 feet from the flag pole on the cupola of the county court-house, almost in front of Mr. McCormick's house, and in about the center of this street. The magnetometer station was on the line joining the center of this stone with the flag pole on the county courthouse, about 10 feet south of the center of the stone. The dip station is in the same line, about 60 feet south of the center of the stone. The mark or range used was the flag pole on

CALIFORNIA—Continued.

the cupola of the county court-house. This mark or range bears from the center of the stone 20° 22′.0 west of true south. A tall slender spire bears 23° 15′.0 west of true south.

Monterey County, San Lucas, 1896.—Observations were made over the center of a 4 by 4 inch redwood post 5 feet long, set 2½ feet in the ground. This post is lettered on one face U. S. MAG. STA. and on the other 1896. It was located on the bluff back of the town, about one-fourth of a mile distant from the Southern Pacific Railroad passenger station, and in a northwesterly direction. This bluff is about 35 feet above the railway tracks. This post is distant 37 feet from the fence line just across the street north of this post. It is also distant from the same fence line 48.5 and 50 feet, respectively, when measured in the direction of the lines joining the center of this post with the Baptist and Methodist church spires when these lines are extended. This post is distant 253.3 feet from the northeast corner of Griswold's barn, at the far corner of the streets north and west of it. The azimuth and dip observations were made over this post. The magnetometer observations 4.2 feet from it, in the direction of the line joining the center of this post with the flag pole on the cupola of the schoolhouse when this line is extended. The flag pole on the cupola of the schoolhouse was used as the mark or range. This mark or range from the post bears 65° 46′.0 east of true south. The spire of the Baptist church bears 56° 10′ west of true south. The vane on the Methodist church spire bears 26° 30′.0 east of true south. The northeast corner of Griswold's barn and the line of the street bears 105° 46′.5 west of true south.

Monterey County, Soledad, 1896.—Observations were made over a small irregular limestone bowlder, 8 inches square on top, buried flush with the ground, and with a small hole marking the center. This bowlder is located about 400 feet in a southeastern direction from the passenger station of the Southern Pacific Railway, 1 foot in front of the fence which forms the southern boundary of the railway station yard. It is distant 136.7 feet from the line of the cattle pens measured along this boundary fence. The magnetometer, azimuth, and dip circle stations were in the line joining the center of this bowlder with the steeple of the Catholic church, which is about one-fourth of a mile distant. The magnetometer, azimuth, and dip circle stations are distant 6, 29.7, and 56 feet, respectively, from the center of this bowlder. The mark or range used was the steeple of the Catholic church. This mark or range from the azimuth station bears 15° 10′.3 east of true north. The east gable of the railroad grain warehouse bears 37° 24′.0 west of true north. The town flag pole bears 4° 03′.5 east of true north.

Napa County, Napa, 1897.—Observations were made over a stone monument 10 inches square, with a cross in its center marking the point. This stone monument is 5 feet long, projecting 2¼ feet above the ground It is lettered on its east vertical face MAG. STA., and on its west face U. S. C. & G. S. 1897. This monument was located in the eastern part of the Napa Insane Asylum grounds and on the dam just west of the reservoir called "Lake Camille." The azimuth was over the center of this stone. The magnetometer station was in the line joining the center of this monument and the vane on the central tower of the Napa Insane Asylum, when this line is extended 8 feet beyond the center of the monument. The dip station is about 50 feet from the center of this monument, about north of it. The mark or range used was the weather vane on the central tower of the Napa Insane Asylum. This mark or range from the center of the monument bears 88° 08′.5 west of true north. The weather vane on the Napa County court-house bears 50° 21′.7 west of true north.

Napa County, Napa, 1898.—Observations were made over the same points occupied for magnetic observations, in the grounds of the Napa Insane Asylum, in 1897, and already described. The azimuth observations were made over the center of the stone monument located on the reservoir dam of Lake Camille. A north meridian monument was also located 750 feet true north of this south meridian stone, on the north side of the road and 2 feet north of the fence marking the present northern boundary of the asylum grounds.

Nevada County, Nevada City, 1897.—Azimuth observations were made over a hewn granite post 4 feet long and projecting 1½ feet above the surface of the ground, 6 by 6 inches on top, with a cross marking the point. It is lettered on its west perpendicular face MAG. STA., on its south face 1897, and on its north face U. S. C. & G. S. This post is located about 2 500 feet westward of the county courthouse, just south of a large excavation made in hydraulic placer mining. It is also about south of where West Broad street crosses the north line of the city limits. It is on a knoll north of a road. A

CALIFORNIA—Continued.

post similar to this south meridian post was located about 1 000 feet true north of it, on the southern edge of West Broad street. The south perpendicular face of this north stone is lettered 1897, its west face MER. MARK., and its north face U. S. C. & G. S. The magnetometer station is in the line joining the center of the south meridian stone with the flag pole on the county court-house when this line is extended 12 feet from the center of the stone. The dip station is in the line joining the center of the south stone with the vane on the cupola of the Methodist church, and distant 60 feet from the center of the stone. The mark or range used was the flagstaff on the county court-house. This mark or range from the south meridian stone bears 81° 45′.0 east of true south. The vane on the cupola of the Methodist church bears 71° 24′.3 east of true south. The south gable of a red-roof gray house just north of West Broad street bears 1° 33′.5 east of true north.

Orange County, Capistrano, 1897.—Observations were made over a rough fossiliferous rock about 3 feet long, projecting 6 inches above the ground, 18 by 6 inches on top, with a small hole marking the center. On the south face of the rock the letters U. S. were roughly cut. This rock was located on the first bench of the ridge north of the town and just east of the railway. This bench is only about 40 or 50 feet above the surrounding lowlands, and it is the end of the ridge of which it forms a part. This stone was placed about 100 feet north from the first decided change in the slope after starting up the ridge. It is about halfway from the foot of the ridge to the first summit. The mark or range used was the pole on the center of the top of the water tank. This mark or range bears 12° 06′.5 east of true south. The northeast corner railing on the top of Judge Egan's house bears 4° 20′.8 east of true south. The old meridian post on the hill to the southwest bears 2° 19′.5 east of true south. The flag pole in front of a store, the lowest visible point, bears 3° 35′.0 east of true south. The iron pin on top of the cupola of the S. C. Railway station bears 9° 02′.0 west of true south. The center of the cupola of a white house bears 77° 58′.2 east of true north. The highest point of the ridge in the far east, just above where the bare rock shows, bears 76° 48′.8 east of true north.

Orange County, Newport Beach, 1897.—Observations were made over the center of a redwood railway tie 5 feet long, projecting 3 feet above the ground. This post was used as a tripod. Its north face is lettered U. S. C. S., MAG. 1897, and its south face U. S. It is located in the sand flat north of all the buildings of the town, about midway between the railroad and the ocean beach, and on a line with the south face of the large railway warehouse, the largest building in this region. This warehouse is east of the railway, and is only a short distance from the railway station, at the beginning of the wharf. It is the first building as you enter the town. The mark or range used was the northeast corner post of the railing on the roof of Sharp's Hotel. This mark or range bears 32° 25′.9 east of true south. The base of the flag pole on the front of the large hotel bears 25° 50′.4 east of true south. The base of the flag pole in the center of the roof of the pavilion bears 37° 37′.9 east of true south.

Placer County, Auburn, 1897.—Azimuth observations were made over a hewn granite post 4 feet long, set 2 feet in the ground, 8 by 8 inches on top, with a cross marking the center. It is lettered on its perpendicular south face MAG. STA., on its west face U. S. C. & G. S., and on its east face 1897. This stone was located two-fifths of a mile east of the county court-house, near the northwest corner of Olive street and Finley lane. The magnetometer station is in the line joining the center of this post with the vane rod on the dome of the county court-house when this line is extended 53 feet from the center of the post. The dip station is on the same line when it is extended 113 feet from the center of the post. A similar post to this north meridian stone was located 130 paces true south of it. This south meridian stone is lettered on its west perpendicular face MER. MARK, on its north face, U. S. C. & G. S., and on its east face, 1897. The mark or range used was the perpendicular rod of the vane on top of the county court-house. This mark or range from the north meridian stone bears 89° 19′ west of true north. The flag pole on the schoolhouse bears 78° 38′ west of true north. The slender golden cross on the Catholic church bears 62° 18′.3 west of true north. The short pole on the west gable of Eurer's Hotel bears 32° 19′.8 east of true north.

Riverside County, Elsinore, 1897.—Observations were made over an irregular granite bowlder 3 feet long, 15 to 20 inches in diameter, with a small hole in the center marking the point, and lettered U. S. This bowlder is located on the ridge just south of the small knoll which is east of the Hot Springs Hotel. It is near the northeast corner of the block bounded by Washington street on the

CALIFORNIA—Continued.

east and Heald street on the south. It is about 29 meters west of the center of Washington street, and is about 20 meters southwest of the top of a small knoll. It is about 1 meter north of the line of the south face of the small house on the opposite side of Washington street, and on the corner of the street next north of Heald street. The Hot Springs Hotel is northwest of this station. The mark or range used was the highest projecting rock of the left-hand rocky peak on the farthest ridge visible in the north. This peak is distinctly rocky, while all to the left of it are not so. This mark or range bears 18° 21′.1 west of true north. The center of the large cupola on the bank building bears 42° 31′.2 west of true south. The flag pole on the spire of the Lake View Hotel bears 52° 05′.7 west of true south. The Presbyterian church spire bears 89° 33′.1 west of true north. The cupola of the school house bears 67° 00′.8 west of true north.

Riverside County, Indio, 1897.—Observations were made over the center of a redwood railway tie 4 feet long, projecting 1 foot above the ground, 8 inches square on top, with a cross marking the center. Its south vertical face is lettered U. S. C. S., and its west vertical face 1897. This post was located nearly 200 meters north of the railway and northwest of the hotel. It is about 20 meters east of the road which extends northwest from near the west side of the hotel. The distance from the railway along this road to a point opposite this redwood post is about 190 meters. The mark or range used was a rectangular object (appearing like a target) on the first small summit to the right of a deep gap in the most distant mountain range in the north. It is a little to the left of a perpendicular to the railway at this hotel or station. This mark or range bears 26° 24′.9 east of true north.

Riverside County, San Jacinto, 1897.—Observations were made over a redwood post 5 feet long, projecting 15 inches above the ground. The north vertical face of this post is lettered U. S. C. & G. S., and its south vertical face 1897. It is 4 by 6 inches on top, with a cross marking the center. This post was located near the middle of the block bounded on the north by Main street and on the west by Santa Fe avenue. It is about 46 meters south of the line of trees on the south side of Main street and about 62 meters east of the center of Santa Fe avenue. Santa Fe avenue is the main thoroughfare to Hemet. This post is located on the property of a man named Freeman. The mark or range used was a rock cairn on the top of, apparently, the highest of the first mountains to the northeast. This mark or range bears 26° 55′.2 east of true north. San Jacinto Peak, the highest on San Jacinto Mountains, bears 82° 20′.3 east of true north. A tall sharp peak on the right of San Jacinto Mountains bears 86° 45′.2 east of true north. The flag pole on the red cupola of I. O. O. F. Building bears 84° 29′.8 east of true north. The flag pole on the schoolhouse at Hemet bears 6° 24′.2 west of true south. The flag pole on the top of the Indian agency bears 65° 39′.8 west of true south.

Sacramento County, Sacramento, 1897.—Azimuth observations were made over a blue sandstone post 4 feet long and set 2 feet in the ground, 8 by 8 inches on top, with a cross marking the center. This south meridian stone is lettered on its east perpendicular face U. S. C. & G. S., on its west face 1897, and on its north face MAG. STA. This stone was located in the southeastern corner of the Catholic cemetery, 17 feet from its east fence, and 91 feet from the southeast corner of this cemetery. A sandstone post similar to this south meridian stone was located 1 000 feet true north of it, near the northern fence of the cemetery. This north meridian stone is lettered on its south perpendicular face MERID. MARK, on its east face 1897, and on its west face U. S. C. & G. S. The magnetometer station is on the line joining the center of this south meridian stone with the ball on the dome of the statehouse when this line is extended 8 feet from the center of this stone. The dip station is on the line joining the center of the two meridian stones 50 feet north of the south stone. The mark or range used was the ball on the dome of the statehouse. This mark or range from the south meridian stone bears 20° 41′.8 west of true north. The cross on the cathedral bears 17° 12′.3 west of true north. The flag pole on the square tower of the Buffalo Brewing Company bears 6° 46′.0 east of true north.

San Benito County, Hollister, 1896.—Observations were made over a small granite bowlder buried a few inches below the surface of the ground, with a small hole in the center of it marking the point. This bowlder was located on the hill just north of the county court-house and west of the west fence inclosing the reservoir occupying the top of this hill. It is distant 61.5 and 96.5 feet, respectively, from the northwest and the southwest corners of the fence around this reservoir. It is also distant 24.5 feet from the third tree of a row of trees northeast of this bowlder. The mark or range was the cross on the spire of the Catholic church. This mark or range bears 3° 22′.1 west of true south. The

CALIFORNIA—Continued.

cross on the cupola of the Catholic convent bears 40° 08′.1 west of true south. The northwest corner of the reservoir fence bears 65° 24′.9 east of true south. The southwest corner of the reservoir fence bears 5° 33′.9 east of true south.

San Bernardino County, Bagdad, 1897.—Observations were made over the center of a redwood railroad tie 3 feet long, set 1½ feet in the ground, 7 by 7 inches, with U. S. C. & G. S. MAG. STA. cut on its east vertical face. This redwood post was located about 130 meters south of the railway, and a little east of the meridian line of the railway station, which is the most eastern substantially built house in the town. The mark or range used was a small projecting rock just below the summit of, apparently, the highest ridge in the west, and just north of the railway. This is a very short ridge, with a conical-shaped peak a little south of it which appears slightly higher than this ridge. This small projecting rock was on the slope opposite to this conical peak. Back of these mountains an iron-colored ridge projects farther to the south. This mark or range bears 59° 12′.8 west of true north.

San Bernardino County, Barstow, 1897.—Observations were made over the center of a painted post 3 feet long, set 2 feet in the ground, 1 by 4 inches in cross section, with M. G. cut on its western vertical face. This post was located in the sand flat north of the town and distant about 150 meters from the railway, directly in front of the north gable of the hotel. The point of this gable is in line with the top of the hill, which is just south of the hotel, when standing 20 feet west of this post. The railway disappears around the points of the ridges to the west and to the east of this post. A line drawn through these two points, where the railway disappears, passes within a few feet of the post. The position of the magnetic station can be fixed by these directions. The mark or range used was the prominent rock near the eastern end of the highest short ridge nearly north of the station. This mark or range bears 0° 20′.6 west of true north.

San Bernardino County, Blake, 1897.—Observations were made over the center of a redwood railroad tie, 5 feet long, projecting 2 feet above the ground, with U. S. C. & G. S. MAG. 1897 cut in its west vertical face. This railway tie was located about 100 meters north of the railway station. The mark or range used was a small projecting rock just south of the highest peak of the mountain almost southwest of the station, and the first mountains north of the railway when looking west. This mark or range bears 57° 27′.8 west of true south.

San Bernardino County, California and Nevada Boundary 35° Post, 1893.—The station is in the permanently marked meridian about 30 meters south of the east post set in 1873 by Van Schmidt on the west bank of the Colorado River, 12 miles north of the town of Needles Station. It is marked by a pile of stones.

San Bernardino County, Kramer, 1897.—Observations were made over the center of a rough quartz rock, 18 inches long, set even with the surface of the ground. This rock was located north of the railway and distant 192.2 meters from the north rail of the main track. It is north of the only saloon in the place, and in line with the west face of this building. A line joining the center of this rock with the highest point of the hills to the southwest of it just clears the northwest corner of a corral built of old logs, which is distant 300 or 400 feet from the center of the rock. A small yucca tree, the only tree in this vicinity, is directly in line to the south gap of the mountains west of the station. The mark or range used was the highest point of the hills to the southwest. This mark or range bears 57° 06′.0 west of true south.

San Bernardino County, Manvel, 1897.—Observations were made over the center of a stone sunk below the surface of the ground with a small rock cairn built over the top of this stone. This cairn was located about 50 feet west of the summit of the first small knoll northeast of the railway station and northwest of the railway grade beyond the railway station. It is about 1 000 or 1 200 feet from the railway station, on a small level plateau. The mark or range used was a telegraph pole north of the railway station and very nearly in line to the lowest gap in the mountains, which is a little south of west of this magnetic station. This mark or range bears 76° 17′.2 east of true south.

San Bernardino County, Needles, 1895.—The station is about 100 feet south of the longitude station which is in the northwest corner of the yard around the Catholic church, 38 feet from the northwest corner of the church. It is about 300 meters from the main track of the Santa Fe Pacific Railroad, and bears southwest from the depot hotel and office of the railroad. It is marked by a pier.

CALIFORNIA--Continued.

San Bernardino County, Oro Grande, 1897.—Observations were made over the center of a quartz rock, set about 2 feet in the ground, and projecting 1 inch above the surface. The letters U. S. were cut in the southeast corner of the top of this stone with a cross in its center marking the point. The top of this stone is 8 by 15 inches. It was located 200 meters from the railway station, in a line 20° east of north of it. The mark or range used was the highest summit of the hills nearly east of this rock. The point observed upon was the small notch in the smoothest part of the summit. There are also two summits in these hills, and to the right of the one on which the mark was selected. A narrow ridge extends to the left a short distance to a gap which connects these hills with higher hills north of them. This mark or range bears 70° 48′.9 east of true south. The flag pole on the cupola of a new schoolhouse bears 22° 36′.4 east of true south.

San Bernardino County, San Bernardino, 1897.—Observations were made over the center of a granite post, 3 feet long, set with its end just above the surface of the ground. This stone is lettered U. S. with a small hole marking the center, and its top is about 4 inches in diameter. This stone was located near the middle of the west half of the city park, between E and F streets and south of Sixth street. It is about 16 meters from the fence line on F street, and about 50 meters from the fence line on Sixth street, in line with the north face of the pavilion, which is located in the center of this park. It is 4 feet from the border of the nearest walkway through the park. The mark or range used was a long, dead tree near the low gap in the mountains north of this granite post. This mark or range bears 13° 59′.2 west of true north. The foot of a flag pole on a red-roof house, distant 2 blocks, bears 6° 59′.4 west of true north. The northwest point of the tower of the high-school building, distant 2 blocks, bears 16° 49′.2 east of true north. The highest mountain peak in the east, and 5° or 10° west of the pavilion, bears 87° 31′.2 east of true north. The cross on the Catholic church spire, distant 1 block, bears 15° 44′.2 east of true south. The top of the flag pole on the schoolhouse across F street, bears 64° 15′.8 west of true south.

San Diego County, Foster, 1897.—Observations were made over a granite stone 30 inches long, 14 by 5 inches on top, with a small hole marking the center. This stone is set firmly in the ground, and U. S. is lettered on its south vertical face. This granite stone was located across the valley nearly southwest from the railway station, 500 feet from the railway in a westerly direction. It is about 20 feet from the beginning of the steep slope of the mountain. It is just south of and around the spur of the mountain or small hill which projects into the valley directly across from the railway station, and west of it. It is also about the middle of the slight wash from the angular ridge between the above-mentioned spur and the mountain side, and south of it. The mark or range used was a bush. This mark or range bears 9° 45′.3 west of true south. The largest bowlder, the only one near the highest summit in the southwest, bears 33° 08′.3 west of true south.

San Diego County, Oceanside, 1897.—Observations were made over a granite post 2 feet long, projecting 2 inches above the ground, 4 by 4 inches on top, with a small hole marking the center. The letters U. S. were cut on the southeast side of the top of this stone. It was placed on the top of the bluff northwest of the center of the town, and bordering the ocean beach. It is distant 50 feet from the edge of the bluff, and is 30 feet west of the line of Washington street, the main street of town, and the first street parallel to the ocean. This stone is approximately on the south line of the first street north of the flour mill, extending at right angles to the ocean front. There is one house distant from this stone about 300 feet just across this street and near the railway track, which is distant 400 feet from the magnetic station. There are two houses on the edge of the bluff south of this granite post, the nearest of which is distant 250 feet. The mark or range used was the foot of the flag pole on the cupola of the schoolhouse, the most prominent building on the top of the ridge to the southeast. This mark or range bears 81° 16′.2 east of true south. The flag pole on the cupola of a large business block bears 68° 01′.2 east of true south. The flag pole on the opera house bears 41° 45′.0 east of true south. The highest point of the most distant mountains in the north bears 13° 32′.4 west of true north. The base of a flag pole on a square yellow house bears 57° 37′.8 east of true north.

San Diego County, San Diego, 1892.—The station is located in the southwest portion of the city park, 34.33 meters south and 15.44 meters west of the center of the brick longitude transit pier (1892). It is about 150 feet southwest of the point where Seventh and Fir streets would intersect if extended

CALIFORNIA—Continued.

into the park. It is 508.7 meters north and 32.9 meters west of Davidson's astronomical station of 1871. It is marked by an Oregon pine stub.

San Diego County, San Diego, La Playa, 1897.—Observations were made over the center of a redwood post 3 feet long, projecting about 1 foot out of the ground. The top of this post is 4 by 4 inches, and it is lettered U. S. MAG. on its north face and 1897 on its west vertical face. This post was located about 4 feet west of a small stub over which Assistant Putnam made observations in 1892 and described elsewhere. Assistant Davidson's station is 18.5 feet north and 11 feet west of this redwood post. An excellent range for finding this magnetic station is to get the small, slender smoke-stack on the small building at the end of the wharf at the quarantine station exactly in line with the north or smaller tower of the Coronado Hotel. Another range is to get the red bouy on the west side of the entrance to San Diego Bay in line with the extreme point of the neck of land upon which the highest house at the entrance is located. This bouy is about midway between the quarantine station and the light-house. The mark or range used was the flag pole on the center of the cupola of the Rosewell schoolhouse. This mark or range bears 19° 13′ east of true north. The standpipe above old town bears 41° 20′.8 east of true north. The center of cupola of San Diego court-house bears 79° 40′.5 east of true north. The large brick stack of the power house, San Diego, bears 80° 16′.0 east of true north. The south and largest cupola of the Coronado Hotel bears 65° 08′.5 east of true south. Loma light-house bears 1° 15′.5 west of true south.

San Francisco County, Presidio, 1898.—Observations were made over the same post and point over which magnetic observations were made by the United States Coast and Geodetic Survey in 1896, 1894, 1893, 1892, 1891, and previous years. The dip station was 31 paces northeast of this station post. The mark or range used was Table Mountain Peak (Mount Tamalpais, eastern peak). This mark or range from the center of the station post bears 35° 48′.7 west of true north, from observations by Assistant Fremont Morse. The mark or range used by Mr. Morse in 1889 from the center of the station bears 40° 24′.6 west of true north. For information as to precise location of this station apply to U. S. C. & G. S. Sub-Office at San Francisco.

[A hundred-meter comparator was laid out in Golden Gate Park in May, 1889, by the party of Assistant G. Davidson. The ends and subdivisions are marked by granite blocks 10 inches square on top and projecting about an inch above the ground. The line is on a level lawn, away from the carriage drives, and is crossed by a foot path near the south end. The north end is protected by a small grove of trees. From the north stone the south stone bears 0° 33′ 04″ west of true south.]

San Joaquin County, Stockton, 1897.—Observations were made near a smooth, white marble post 4 by 4 inches on top, 4 feet long, and projecting 18 inches above the ground, with a small hole in the center marking the point. The north vertical face of this marble post is lettered 1897, the east face MAG. STA., and the west face U. S. C. & G. S. This stone was located in the northwestern corner of the Rural Cemetery, about 2¼ miles north of the county court-house. It was placed on a dike 16 feet from the north fence of the cemetery and 30.5 feet east of its northwest corner, as measured along the fence line. The azimuth station was over the center of this marble post. The magnetometer station was in line joining the center of the marble post with the top of the statue on the court-house dome, and distant 10 feet from the center of this post. The dip station is 50 feet about east of the magnetometer station. The mark or range used was the top of the statue on the county court-house dome. This mark or range from the stone bears 5° 34′.6 east of true south. The spire of the central Methodist Episcopal church bears 6° 22′.1 east of true south. The cross on the Episcopal church bears 6° 04′.6 east of true south. The top of the roof of a square tank house bears 64° 05′.9 east of true north.

San Luis Obispo County, Port Harford, 1896.—Observations were made over the center of a block of stone 8 by 10 by 17 inches with its top projecting 2 inches above the ground. This stone was located on the hillside about 420 meters north of the Marré Hotel. It is distant 112 feet from the water tank, which is in the line from this stone to the hotel. The azimuth observations were made over this stone, the magnetometer observations in the line joining the center of this stone with the flag pole on the northwest gable of the railway warehouse on the end of the pier when this line is extended 22.3 feet. The dip observations were made on a line at right angles to this line and 50 feet nearer the bay than the magnetometer station through which the line passes. The mark or range

CALIFORNIA—Continued.

used was the flag pole on the railway warehouse, as already described. This mark or range bears, from the azimuth station, 7° 04′.5 east of true south. The flag pole on the Hotel Marré bears 21° 26′.7 west of true south.

San Luis Obispo County, Santa Margarita, 1896.—Observations were made over the center of a 6 by 6 inch redwood post 4 feet long set 2½ feet in the ground. This post is lettered on one of its faces, U. S., on a second face, MAG. STA., and on a third face, 1896. It was located on a knoll about 500 feet south of the passenger station of the Southern Pacific Railroad Company. It is on the east edge of the street line distant 112.6 feet from the near street corner north of it, as measured along this eastern street line. It is also distant 57 feet from a white-oak tree almost north of it. The azimuth observations were made over this post, the dip observations in a line joining the center of this post with the flag pole on the cupola of the schoolhouse and distant 32 feet from it. The magnetometer observations were made on the same line 18 feet from the post, extended in the opposite direction. The mark or range used was the base of the flag pole on the cupola of the schoolhouse. This mark or range bears from the azimuth station 50° 21′.3 east of true north. The north line of the street line bears 33° 35′.7 west of true north. The flag pole on the circular dance house bears 3° 49′.3 east of true north.

San Mateo County, Sierra Morena, 1884.—The station is distant 28.5 meters from the geodetic station in line with Mount Diablo. The geodetic station is reached from Redwood City via county road through Woodside to the "Mountain Brow House," kept by Frank King, who knows the location of the station. It is about 2½ miles south, on the highest knoll in that vicinity. It is marked by a solid concrete pier extending about 4 feet above the surface of the ground.

Santa Barbara, Los Olivos, 1897.—Observations were made over a white limstone bowlder 1½ feet long, 8 inches thick, projecting 6 inches above the surface of the ground. The top of this stone is lettered U. S., with a small hole in its center marking the point. This bowlder was located about 800 feet northeast of the Pacific Coast Railway station, the present terminus of this railway at Los Olivos. It is near the center of a circular cultivated field, about 850 feet above the sea level, in line between two white oak trees east and west of it, and distant, respectively, 8 and 28 feet from them. There is a meadow below the circular hill west and south of this cultivated field. The azimuth observations were made over this bowlder, and the magnetometer observations on the line joining the center of the bowlder with the vane on the schoolhouse tower, when this line is extended 39 feet. The dip observations were made over a point about 50 feet southwest of this bowlder. The mark or range used was the vane of the schoolhouse tower. This mark or range from the bowlder bears 32° 17′.4 east of true south. The belfry on the Christian church, distant about one-half mile, bears 50° 13′.4 west of true south.

Santa Barbara County, Santa Barbara, 1897.—Observations were made over a point near the magnetic station of 1881, near the beach a little west of the end of the long wharf on Burton Mound, and near the north end of the Burton House. It is distant 28.7 feet from the signal pole at Burton, which is south and west of it. This signal pole is distant 22.5 feet from the northeast corner of the Burton House. The azimuth observations were made over this point. The magnetometer observations were made on a line joining this point with the East End Methodist Church spire when this line is extended 9 feet. The dip observations were made on a line at right angles to this line, passing through the azimuth station and 34 feet about west of it. The mark or range used was the steeple of the East End Methodist Church. This mark or range bears from the azimuth station 37° 36′.5 east of true north. The Burton signal pole bears 60° 36′.5 west of true south. The south one of the two mission towers bears 32° 44′.5 west of true north. The middle one of the electric power-house smokestacks bears 35° 43′.0 east of true north.

Santa Barbara County, Santa Maria, 1896.—Observations were made over a stone 2½ feet long, set about one-half foot below the surface of the ground. This stone is 5 by 7 inches on top, with a small hole marking the center. It was located at the NE. corner of the SE. ¼ of sec. 10, T. 10 N., R. 34 W. (S. B. M.) It is in the center of a much-traveled road almost opposite a lane entering this road at right angles, and in line with the southern fence of this lane. It is distant 30 feet from the western fence line of the road. It is also distant 54 feet from this fence line when measured on the line passing through the center of the stone and the flag pole on the grammar-school building when this line is extended. The observations with the magnetometer were made at a point on this

CALIFORNIA—Continued.

extended line distant 103 feet from the stone. The dip observations were made over a point about 60 feet west and 10 feet north of the stone. The azimuth observations were made over the stone. The mark or range was the base of the flag pole on the grammar-school building. This mark or range from the azimuth station bears 32° 04′.0 east of true south. The flag pole on Masonic Hall bears 1° 58′.5 west of true south. The Methodist church spire bears 10° 42′.1 west of true south. The one-half section division line in the fence direction bears 89° 02′.0 east of true south.

Santa Clara County, Loma Prieta or Mount Bache, 1884.—The station is distant 14.63 meters from the geodetic station, nearly in the direction of Mocho geodetic station. The geodetic station is situated on the highest peak of the range of mountains forming the boundary line between the counties of Santa Clara and Santa Cruz. It is locally known as Loma Prieta. It is marked by a concrete pier 3½ feet high.

Santa Clara County, Mount Hamilton, Lick Observatory, 1901.—The station is 78 feet, 29¼° west of magnetic south of the south corner of the Coast and Geodetic Survey astronomical house. It is marked by a stake, but Professor Campbell, the director, has promised to mark it in a more permanent manner.

Santa Clara County, Mount Mocho, 1887.—The station is 159 feet 7 inches north of the geodetic station "Mocho." It is marked by a wooden post. The mark or range used was the center of the large dome of the Lick Observatory on Mount Hamilton, and bears 26° 57′.6 west of true south.

Santa Clara County, San Jose, 1896.—Observations for declination and intensity were made over a small angular bowlder buried a few inches below the surface of the ground. There is a small hole in the center of a cross in the top of this stone marking the point. The observations for dip and azimuth were made over a point 50.4 feet distant from this bowlder, in the line joining the center of the bowlder with the flag pole on the court-house where this line is extended. This bowlder is situated in Oak Hill Cemetery, about 3 miles south and 1 mile east of the county court-house. The point over which the dip and azimuth observations were made is 52 feet westward from the small reservoir (in the extreme western part of the cemetery), measured on the central line of this reservoir when this line is extended. It is also distant 68.6 feet a little east of north from the corner of the cemetery boundary fence. The mark or range used was the flag pole on the court-house. This mark or range bears from the azimuth and dip station 27° 37′.5 west of true north. The flag pole on the Normal School Building bears 20° 40′.3 west of true north. The center of the reservoir bears 91° 15′.0 east of true north. The center of the large dome of the Lick Observatory bears 75° 44′.3 east of true north.

Santa Cruz County, Santa Cruz, 1896.—Observations were made over a honeycombed limestone bowlder buried a few inches below the surface of the ground. The top of this bowlder is cut away, leaving a small bench about 1½ inches square. A small hole in the center of this bench marks the point. This bowlder was located on the United States Light-House Reservation, in the line with the center of the light-house and the flag pole of the reservation when this line is extended. It is distant 108.2 feet from the flag pole, and 42.2 feet from a brick wall near the circular roadway southeast of this bowlder. Observations for dip were made over a point 50 feet distant from this bowlder in the line to the Baptist church spire. The mark or range used was the spire of the Twin Lakes Baptist church. This mark or range bears 60° 35′.1 east of true north. The center of the light-house and flag pole bears 12° 06′.7 west of true north. The center of the brick wall bears 36° 26′.4 east of true south.

Shasta County, Redding, 1897.—Azimuth observations were made over a hewn granite post 4 feet long, projecting 1½ feet above the surface of the ground, 11 by 7 inches on top, with a cross marking the center. This north meridian stone is lettered on its west perpendicular face, U. S. C. & G. S., on its east face, MAG. STA., and on its south face, 1897. It was located about three-fourths of a mile northwestward from the county court-house, and about 800 feet east of the western end of the long curve which begins at the railway station of the Oregon Division of the Central Pacific Railroad. It is about 250 feet south of the railway track, and is near the northern edge of the plateau-like bench between the south bank of the Sacramento River and the hill south of it. Another granite post was located 700 feet true south of this north meridian stone, with a cross marking its center. This south meridian stone is lettered on its west vertical face, U. S. C. & G. S., on its north face, 1897, and on its east face, MER. MARK. The magnetometer station is on the line joining the center of the north stone

CALIFORNIA—Continued.

with the center of the head of the statue of Justice on the cupola of the court-house when this line is extended 15 feet from the center of the stone. The dip station is on the line joining the centers of the north and south meridian stones, 60 feet south of the center of the north stone. The mark or range used was the center of the head of the statue of Justice on the cupola of the court-house. This mark or range from the north meridian stone bears 38° 10′.5 east of true south.

Solano County, Fairfield, 1897.—Observations were made near a smooth white marble post 4 feet long set 2 feet in the ground, 8 by 8 inches on top, with a cross marking the center. The east perpendicular face of this post is lettered MAG. STA., and its north face 1897, and its south face U. S. C. & G. S. This marble post was located 1 120 feet west and 2 100 feet south of the county court-house. It is near the corner of a block, as the town is laid out, 310 feet west of the corner fence of a field, and 10.7 feet north of the south fence of this field. A similar post to this south meridian stone was located about 1 170 feet true north of it, 12 feet west of the northwest corner of a block of this town, as laid out. This north meridian stone is lettered on its perpendicular south face MER. MARK, on its west face U. S. C. & G. S., and on its east face 1897. The azimuth station is on the line joining the center of these two meridian stones, when this line is extended 15 feet south of the south meridian stone. The magnetometer station is on the line joining the center of the azimuth station with the flag pole on the court-house, when this line is extended 22.5 feet from the azimuth station. The dip station is about 50 feet true east of the magnetometer station. The mark or range used was the flag pole on the county court-house building. This mark or range from azimuth station bears 27° 53′.4 east of true north. The flag pole on the high school building bears 34° 28′.2 east of true north. The flag pole on the Masonic House at Suisun bears 30° 36′.6 east of true south. The tall flag pole at Suisun bears 27° 55′.6 east of true south. The mark or range from the center of the south meridian stone bears 28° 03′.8 east of true north. The flag pole on the high school building bears 34° 42′.3 east of true north. The flag pole on the Masonic House at Suisun bears 30° 24′.0 east of true south. The tall flag pole at Suisun bears 27° 45′.9 east of true south.

Solano County, Mare Island Navy-Yard, 1887.—Surface stones gone.

Sonoma County, Santa Rosa, 1897.—Observations were made over a granite post 5 feet long set 3½ feet in the ground, 8 by 8 inches on top, with a small hole in the center marking the point. The east vertical face of this stone is lettered U. S. C. & G. S., 1897, and the west face MAG. STA. The post was located in the grounds of the Pacific Methodist College, and 3 feet from the south fence of these grounds. A similar granite post was set 586 feet true north of this post near the north fence of the grounds. This north stone is lettered on its perpendicular west face MERID. MARK, and on the east face U. S. C. & G. S., 1897. The azimuth station is over the center of the south monument. The magnetometer station is on the line joining these two monuments 36 feet from the south monument. The dip station is 60 feet true east of the magnetometer station. The mark or range used was the tip of the spear in the hand of the statue on the court-house dome. This mark or range from the south stone bears 1° 21′.0 west of true south. The base of the flag pole on the round tower of the college residence building bears 38° 23′.0 west of true north. The top of the short pole on the square tower of the main college building bears 32° 57′.0 east of true north.

Stanislaus County, Modesto, 1897.—Observations were made within a few feet of a granite block 12 by 17 by 28 inches, lettered on its top U. S. 1897, Mag. Sta., with a small hole in its center marking the point. This granite block is firmly set and projects about 10 inches out of the ground. It was located in the rear part of the Odd Fellows' Cemetery, about three-fourths of a mile northeast of the county court-house. It is on the line of the northern boundary fence, 52 feet west of the nearest edge of the brick receiving vault. The azimuth station is on the line joining the center of this stone with the bottom of the flag pole next to the statue on the court-house, distant 43.4 feet from the center of the granite block. The magnetometer station is in the same line, distant 9.4 feet from the center of the granite block. The dip station is 55 feet south of the magnetometer station. The mark or range used was the bottom of the flag pole next to the statue on the court-house building. This mark or range from the azimuth station bears 51° 11′.3 west of true south. The rod on the vane of the North Methodist Church spire bears 49° 53′.3 west of true south.

Tehama County, Red Bluff, 1897.—Azimuth observations were made over a hewn granite post 4 feet long, projecting 1½ feet above the ground, 6½ by 7 inches on top, with a cross marking the

CALIFORNIA—Continued.

center. This north meridian stone is lettered on its north vertical face 1897, on its east face MAG. STA., and on its west face U. S. C. & G. S. It was located about 1¼ miles northwestward from the county court-house, and is on the line forming the northeastern boundary of Johnson street, and is about 648 feet from the northwestern boundary line of Breckenridge street. A similar post to this north meridian stone was located 970 feet true south of it, on the southern edge of the county road. This south meridian stone is lettered on its west vertical face MER. MARK, and on its south face 1897, and on its north face U. S. C. & G. S. The magnetometer station is on the line joining the center of the north meridian stone with the flag pole on the belfry of the Red Bluff public school, when this line is extended 15 feet from the center of the stone. The dip station is on the same line 50 feet from the center of the stone in the direction of the schoolhouse. The mark or range used was the flag pole on the belfry of the Red Bluff schoolhouse. This mark or range from the north meridian stone bears 40° 27′.0 east of true south. The spire of the Presbyterian church bears 67° 19′.7 east of true south. The rod on the town hall belfry bears 66° 08′.3 east of true south. Mount Lassen Peak bears 61° 32′.0 east of true north. Mount Shasta Peak bears 1° 54′.7 east of true north.

Tulare County, Visalia, 1897.—There was planted here a hard bluish-looking stone, 10 by 5 by 18 inches, projecting 2 inches above the ground. The top of the stone is lettered U. S., with a cross marking the center. This stone was located on the southeast corner of the Visalia cemetery, on the eastern fence line, 29.6 feet north of the southeast corner of the cemetery. The azimuth station is in the line joining the center of this stone with the flag pole on the Visalia public school when this line is extended 5.5 feet in the cemetery. The magnetometer station is on the same line, 21.7 feet from the center of the stone, when this line is extended in the cemetery. The dip station is 55 feet north of the magnetometer station. The mark or range used was the base of the flag pole on the Visalia public school tower. This mark or range from the azimuth station bears 61° 50′.7 east of true south. The base of the flag pole on the high school building bears 85° 52′.8 east of true north.

Tuolumne County, Mount Conness, 1890.—The station is 20.7 feet west and 57.7 feet north of the transit pier (which is 5.07 feet west of the lat. pier) and 28.6 feet east and 81.4 feet north of the vertical circle pier. The mark or range used was azimuth mark on Mount Hoffman, about 13½ miles distant, and bears 50° 50′.5 west of true south.

Ventura County, Ventura, 1897.—Observations were made over a point located about one-half a mile from the seashore on the slope of the hill just back of the mission. The azimuth station is in the street outside of the "Hill" or "Brick" schoolhouse grounds, 14 feet in front of the retaining wall forming the division between the grounds and the street, and distant 13.1 feet from the southeast corner of these grounds, measured along this wall. There is a U.+S. cut into the perpendicular face of this wall 13.1 feet from this southeast corner, 1½ feet below the top of the wall. A vertical plane joins the azimuth station with the Methodist church steeple, and passes through this cross on the wall when this plane is extended 14 feet from the station. The magnetometer station was in this same plane between the azimuth station and this wall, distant 5 feet from the wall. The dip station is also in this plane in the school grounds, distant about 30 feet from the wall. The mark or range used was the Methodist church spire. This mark or range from the azimuth station bears 37° 01′.2 east of true south. The cross on the mission tower bears 19° 23′.0 east of true south. The high school tower bears 70° 19′.2 east of true south.

Yolo County, Woodland, 1898.—Azimuth observations were made over a hewn granite post 4¼ feet long, projecting 1½ feet above the ground, 13 by 6 inches on top, with a cross marking the center. This south meridian stone is lettered on its east vertical face U. S. C. & G. S., on its west face MAG. STA., and on its south face 1898. It was located in the southwestern part of Woodland, 6½ feet east of the west line of Lola street and about 277 feet south of the south line of Pendegast street. A similar post to this south meridian stone was located 1 659 feet true north of it, 6½ feet south of the north line of Oak street and 24½ feet west of the east line of Lola street. This north meridian post is lettered on its north vertical face MER. MARK, on its south face U. S. C. & G. S., and on its west face 1898. The magnetometer station is on the line joining the center of the south meridian post with the rod on the weather vane of the high school tower when this line is extended 26.5 feet from the center of the post. The dip station is on the same line 50 feet from the post and south of it. The mark or range used was the rod on the weather vane of the high school tower. This mark or range,

CALIFORNIA—Continued.

from the south meridian stone, bears 53° 29′.5 east of true south. The flag pole on the cupola of the public school bears 7° 40′.3 east of true north.

Yuba County, Marysville, 1897.—Azimuth observations were made over a smooth blue sandstone post 4 feet long, set 2¼ feet in the ground, 8 by 8 inches on top, with a cross marking the center. This south meridian stone is lettered on its west perpendicular face MAG. STA., on its south face 1897, and on its north face U. S. C. & G. S. It was located three-fourths of a mile northwest of the county court-house at Marysville; it is also about three-fourths of a mile northeast of the county court-house at Yuba City, Sutter County, near the western edge of the town of Marysville, about 300 yards north of the railway to Yuba City and 130 yards west of the levee. A similar post to this south meridian stone was located 350 paces true north of it. This north meridian stone is lettered on its north vertical face U. S. C. & G. S., on its west vertical face MERD. MARK, and on its south face 1897. The magnetometer station was on the line joining the center of the south meridian stone with the rod on the Presbyterian church spire when this line is extended about 10 feet from the center of the stone. The dip station is about 10 feet southwest of the magnetometer station. The mark or range used was the rod on the Presbyterian church spire. This mark or range, from the south meridian stone, bears 59° 25′.0 east of true south. The cross on the Catholic church spire bears 72° 48′.5 east of true south. The flag pole on the county court-house bears 63° 37′.0 east of true south. The Methodist church spire bears 51° 35′.0 east of true south.

COLORADO.

Arapahoe County, Denver, 1899.—Observations were made over the center of a stake 1 foot long and 1 by 1 inch on top, driven flush with the ground. This stake was located in the city park, about 2½ miles east of the capitol grounds, in the open space west of the road to the northern entrance of the park and north of the new lake. It is in the line between the water tower towards Fair Mount, and Mr. Dwight's barn and is southwest of the bicycle track. This stake is distant about 420, 175, and 240 feet, respectively, from the southwest corner of an outhouse near the bicycle track, from the center of the road to the north entrance of the park in an east and west line and from the center of this road in line to the water tower. This stake is also distant about 550, 350, and 485 feet, respectively, from the eastern, from the central, and from the western points of the improved plot in the driveway next to the lake. Three other stakes were driven around this central stake, projecting 1 foot above the ground and distant from it 2.60 feet. The northern stake is in line with the Hannon Church tower, which was used as a mark or range. This Hannon Church tower bears 4° 23′.4 east of true south.

Arapahoe County, Gerdts, 1900.—Observations were made over a cedar post 3 by 4 inches on top, about 33 inches long, set 28 inches in the ground. This post is located on Gerdt's ranch on the Arickaree River, Arapahoe County, 20 miles south of Yuma and about 50 miles northwest of Burlington. It is placed on the SE. ¼ sec. 14, T. 4 S., R. 48 W., on the brow of a hill about 100 yards southwest of the ranch house of Gerdt's ranch. The mark or range used was the shaft of the windmill up the valley to the west. This mark or range bears 84° 00′.9 west of true south. The shaft of the north windmill of this ranch bears 34° 46′.9 east of true north. The shaft of the south windmill of this ranch bears 66° 55′.3 east of true north.

Baca County, Springfield, 1900.—Observations were made over a red sandstone post 30 inches long, set about 29 inches in the ground. The top of this post is lettered U. S. C. S., with a cross in the center of it. The center of this cross marks the point. This post is in an open space on the west side of Main street, near the town windmill and water tank. It is distant 118.5 feet and 194.9 feet, respectively, from the southwest corner of the windmill and from the southeast corner of a house north of this stone post. The mark or range used was a distant object which bears 12° 03′.6 east of true south. The flagstaff on the cupola of the schoolhouse bears 70° 53′.1 west of true north. The gable of the house just north of this post bears 2° 46′.3 east of true north.

Bent County, West Las Animas, 1888.—The station is in the lot at the southwest corner of Tenth street and Carson avenue, 48 feet from the inner edge of the plank sidewalk on Tenth street and 131 feet from the inner edge of the plank sidewalk on Carson avenue. It is marked by a cedar post.

Cheyenne County, Arapahoe, 1892.—The station is in the SE. ¼ NE. ¼ NW. ¼ NE. ¼ sec. 10,

COLORADO—Continued.

T. 15, R. 42 W. It is about 7 miles southeast of Arapahoe station, on the Union Pacific Railroad, on the highest hill in the neighborhood. It is marked by a tack in the end of a white oak post.

Cheyenne County, Cheyenne Wells, 1892.—The station is in the northern part of T. 13 S., R. 45 W., about 9 miles northwest of the town on the Union Pacific Railroad. It is marked by a block of limestone 11 inches square on top, with two intersecting grooves.

Cheyenne County, Cheyenne Wells, 1900.—Observations were made over a copper tack in a cedar post 5 by 5 inches on top and 3½ feet long, set about 38 inches in the ground. This post is located about 350 yards northwest of the court-house, just north of the church and the city water tank. It is distant 142.2, 184.7, and 197.8 feet, respectively, from the water tank, from the northwest corner of the church and from the northwest corner of a barn southeast of the station. The mark or range used was the lightning rod on a house. This mark or range bears 16° 46′.3 west of true south. The base of the flagstaff on the schoolhouse bears 47° 37′.6 east of true south. The cupola of church near railway station bears 14° 51′.2 east of true south.

Cheyenne County, First View, 1892.—The station is in the NE. ¼ NE. ¼ NW. ¼ NE. ¼ NW. ¼ sec. 34, T. 14 S., R. 46 W. It is 221.2 meters south 82° 42′.8 west from the half-section corner at the center of section line 27 and 34. It is on a hill 1½ miles south by west of First View, a station on the Union Pacific Railroad. It is marked by a block of soft cream-colored limestone 9 inches thick, and 9 inches by 12 inches across, with cross marks to mark the exact point.

Cheyenne County, Landsman, 1892.—The station is in the NW. corner T. 13 S., R. 46 W. It is about 9 miles north-northwest from the station First View, on the Union Pacific Railroad. It is marked by an irregular block of yellowish white sandstone about 5 inches by 10 inches in cross section, with cross marks.

Cheyenne County, Monotony, 1892.—The station is in the SE. corner NW. ¼ SW. ¼ NW. ¼ NE. ¼ sec. 8, T. 12 S., R. 43 W. It is on the highest point of the divide between the north fork of Smoky Hill River on the north and Sand Creek on the south. Mr. A. Eichels knows the location. It is marked by a piece of white oak fence post.

Conejos County, Conejos, 1899.—Observations were made over a copper tack in a stub driven flush with the ground. This stub was located in the court-house grounds, in the line between the court-house tower and the bell tower of the school building. It is distant 153.5 and 299.2 feet, respectively, from the southwest and the northwest corners of the court-house building. It is also distant 109.8 feet from the northwest corner of the fence inclosing the court-house grounds. The railway and express station for Conejos is Antonito, and about 1½ miles south of it. The mark or range used was the intersection of the eastern dormer window roof and the roof of the residence of Mr. Sampson about five-eighths of a mile distant. This mark or range bears 6° 10′.8 east of true south.

El Paso County, Colorado Springs, 1886.—The station is about 100 feet east and 161 feet north of the astronomical station, which is located in the Experimental Garden about 200 feet west of the east gate and north of the main walk. The Experimental Garden is just east of the passenger depot of the Denver and Rio Grande Railroad.

El Paso County, Pikes Peak, 1895.—The station is 69.7 feet from the geodetic station 41° 06′.6 east of true south. The geodetic station is on the summit of the peak and is marked by a hollow stone and cement pier 12.8 feet high.

Garfield County, Tavaputs, 1891.—The station is in the line Tavaputs geodetic station Treasury Peak, 35 feet 9 inches from the former. The geodetic station is on the southern edge of Book Mountains about 3 miles from the boundary line between Utah and Colorado. It is about three-fourths mile east of Bitter Creek which has its source in a spring 1¼ miles north of the station.

Gunnison County, Gunnison, 1886.—The station is in the court-house yard in the rear of the court-house 100 feet south and 2 feet west of the astronomical station which is marked by a stone pier.

Gunnison County, Mount Treasury, 1893.—The station is located on the summit of Treasury Mountain, a prominent peak in the Elk Mountain range. It is about 500 feet east and 150 feet above the entrance of the Eureka silver mine. It is 30.73 meters from West Base station to southwest and 626.85 meters from Mount Treasury triangulation station to northwest. The mark or range used was Snow Mass Peak and bears 11° 08′.1 east of true north.

COLORADO—Continued.

Hinsdale County, Uncompahgre, 1895.—The station is 26.63 meters almost due south of the geodetic station. The geodetic station is on the north side of the summit of Uncompahgre Peak within 10 feet of the edge of the perpendicular cliff.

Kiowa County, Sheridan Lake, 1900.—Observations were made over a cedar stake 5 inches in diameter and 32 inches long, set about 31 inches in the ground. This station is located between Main street and the church, approximately in line with the south or front wall of this church. It is distant 118.1 and 100 feet, respectively, from the corner of the church and from the approximate center of Main street. The mark or range used was the east lightning rod on the first stone building to the south of the stake. This mark or range bears 2° 52′.5 west of true south. The west lightning rod on Citizen's Bank bears 20° 12′.3 west of true south. The spire on the cupola of the schoolhouse bears 61° 29′.5 west of true north.

Kit Carson County, Burlington, 1900.—Observations were made over a copper tack in a white cedar post 5 inches in diameter and 42 inches long, set 38 inches in the ground. This post is located on the vacant lot in the second block north of the court-house. It is distant 279.8, 255.5, and 237 8 feet, respectively, from the southwest and northwest corners of the inclosure east of this post and from the northeast corner of the inclosure west of the post. The mark or range used was the flagstaff on the court-house. This mark or range bears 1° 25′.6 west of true south. The line, center "C" post to the railway, bears 51° 04′.0 west of true north. The bottom of the flag pole on schoolhouse bears 90° 48′.1 east of true north.

Lake County, Mount Elbert, 1894.—The station is 10 feet almost due west of the geodetic station. The geodetic station is on the summit of Mount Elbert, about 7 miles by trail from the Post-Office Twinlakes (Dayton).

Las Animas County, Trinidad, 1888.—The station is almost opposite the Methodist church on Maple street. It is in the yard of the public high school, 59 feet 1 inch from the northeast corner of the school building, 65 feet 2 inches from the inner edge of the sidewalk on Maple street, and 16 feet 9 inches from the inner edge of the plank fence marking the northern boundary of the school grounds. It is marked by a cedar post.

Logan County, Sterling, 1900.—Observations were made over a stone post 6 by 6 inches on top, 3 feet long, set 33 inches in the ground. The top of this stone is lettered U. S. C. & G. S., with a small hole in the center of it. This hole marks the point. This post is located in Mr. G. C. Brown's pasture, about 1½ to 2 miles west of Sterling. It is placed on the brow of the hill about 500 feet south of the Sterling and Greeley road. This pasture land is school land, and is leased by Mr. Brown. The mark or range used was a telegraph pole showing through the draw. This mark or range bears 11° 04′.8 east of true south. The spire of the Presbyterian church bears 86° 25′.4 east of true north. The spire of the Baptist church bears 85° 15′.6 east of true north.

Mesa County, Chiquita, 1895.—The station is on the northern rim or brow of Pinon Mesa, about 12 miles southwest of Grand Junction.

Mesa County, Grand Junction, 1895.—The station is the longitude station of 1886, located in Cottonwood Park, near the northeast corner. It is marked by three stones, two 6 feet long, 8 inches square, sunk 3 feet in the ground, and the third placed between them. The third stone is smaller and is marked on top with two intersecting grooves.

Prowers County, Lamar, 1900.—Observations were made over a copper tack in a cedar post 5 inches in diameter and 3 feet long, set 3 feet in the ground. This post is located in the vacant block adjoining the school building, It is distant 325 feet from the southwest corner of the school building. It is also distant 163.5, 200, and 233.3 feet, respectively, from the centers of the streets south, west, and north of this vacant lot. The mark or range used was the center post in the city water tank. This mark or range bears 28° 23′.9 east of true south. The church spire just below the hill bears 24° 22′.1 east of true north. The tip of the belfry of the schoolhouse bears 85° 25′.7 east of true north.

Pueblo County, Plateau, 1894.—The station is 70.7 meters from the geodetic station on the line to Little Pisgah Peak. The geodetic station is on a high plateau about 9 miles north-northeast of Pueblo, Colo., and 3½ miles northeast of Overton. (It is on land owned by Mr. Steel.) It is on the highest ground at the north end of the plateau. It is 252.2 feet from the north gatepost of the fence along the east boundary from Mr. Steel's property and 168 feet from the second solid fence post from

COLORADO—Continued.

the north post of the gate. It is marked with a granite post 6 inches square, on top lettered U. S. C. S., with two intersecting grooves.

Pueblo County, Pueblo, 1899.—Observations were made over a copper tack in a stub 1 foot long and 1½ by 1½ inches on top, driven about flush with the ground. This stub was located in the southwest corner of the Mountain View Cemetery, 61.2 feet from the western fence line, 126.3 feet from the southern fence line of this cemetery, and near Lawrence and Willow avenues. This point is about 2½ to 3 miles south of the station where magnetic observations were made in 1888, which is no longer available. The mark or range used was the southern ridge of Mr. Mahoney's house. This mark or range bears 31° 19′.9 east of true south.

Saguache County, Mount Ouray, 1894.—The station is 50.4 feet almost due north of the geodetic station. The geodetic station is located on the summit of Mount Ouray on the "Great Continental Divide." It is about 4,000 meters in a northeasterly direction from Marshall Pass railroad station.

Washington County, Akron, 1900.—Observations were made over a stone post 6 by 6 inches on top and 3 feet long, set 34 inches in the ground. The top of this post is lettered U. S. C. & G. S. with a cross in the center of it. The center of this cross marks the point. This post is located on the vacant lot west of the brick school building, and in line with the north side of this school building. It is distant 390 feet from the northwest corner of the school building and 204 feet from the center of the principal street of the town, which is west of this vacant lot. The mark or range used was the tip of the cupola on the Methodist church. This mark or range bears 15° 35′.8 west of true south. The tip of the center post on the water tank bears 20° 04′.5 west of true south. The tip of the belfry on the schoolhouse bears 83° 04′.2 east of true south.

Yuma County, Yuma, 1900.—Observations were made over a stone post 6 by 6 inches on top and 3 feet long, set 34 inches in the ground. The top of this post is lettered U. S. C. & G. S., with a cross in the center of it. The center of this cross marks the point. This post is located on a vacant lot about one-half mile south of the Burlington Railway, southeast of the Presbyterian church, and northwest of the city water tank. It is distant 270 and 155.9 feet, respectively, from two fire hydrants near the western edge of Main street. It is distant 287.1 feet from the southeast corner of the Catholic church, which is across the street west of this post. The mark or range used was the tip of the post on the center of the railway water tank. This mark or range bears 31° 13′.2 east of true north. The lower part of the spire of the Presbyterian church bears 22° 08′.8 west of true north.

CONNECTICUT.

Hartford County, Hartford, 1890.—The station is located in the large open space in the capitol grounds northeast of the State capitol, at the foot of the hill and in what was "the new park." The point is about halfway between the stone bridge and the bridge leading directly to the railroad depot and about 100 yards from the river. It is marked by a dressed stone post sunk 2 feet in the ground, with its top flush with the surface. The top of this post measures 4 inches by 4 inches, and is lettered U. S. C. S. This stone is distant 41 yards from the inner edge of asphalt connecting the two bridges, and also distant 54 yards from the road leading to the railroad station. The spire of the South Baptist church bears 49° 57′ east of true south.

Hartford County, Schoolhouse Hill, 1891.—In the western part of Rocky Hill Township, about 8 miles south of Hartford on the property of Mr. G. W. Codair. It is 222 feet from the northeast corner of the brick schoolhouse and about 85 feet east of a fence.

Hartford County, Taylor, 1891.—On Chestnut Hill in South Glastonbury, on the property of Noel H. Moses. The station is just west of a single row of apple trees running north and south across the top of the hill and about 89 feet from the west fence, 472.5 feet from north fence, and 294.3 feet from the south fence of the field.

Middlesex County, Westfield, 1891.—About a mile and a half south of Westfield in the northwestern part of Middletown Township, on land of Ebenezer Bacon. The station is in a field with numerous apple trees, 13¼ feet from the east fence and 191 feet from the south fence.

New Haven County, New Haven, 1895.—The station is located in the grounds of the Yale Astronomical Observatory, 205 feet 9¼ inches due north of the center of the transit of the observatory. The exact point is marked by a copper tack in the end of a solid red cedar post 2½ feet long, sunk flush with the surface of the ground.

DELAWARE.

Kent County, Bombay Hook, 1899.—The station is in a field on the beach in the line joining Duck Creek Light and Woodland Beach Hotel. It is about 500 feet south of a stunted tree near the tide line and about five-eighths mile from the hotel.

Kent County, Dover, 1897.—Station is in the east half of the public park near the center of the town. The exact point is marked by a pine stake driven flush with the surface of ground. The stake is about 1 meter north of the line of the south fence of the capitol building and about 30 meters west of its west fence. It is also about 5 meters southwest of the large elm tree which stands at the eastern edge of the park, a little south of the front entrance to the capitol.

Kent County, Harrington, 1899.—The station is located in the northwest corner of the white public school, the exact point being marked by a tent peg. This peg is 19.6 feet south of the north fence, 28.6 feet from the corner, and 14.2 feet from the west fence.

Newcastle County, Newark, 1899.—The station is on the farm of the Lewis heirs, three-fourths mile from depot, south of Delaware avenue about 350 feet, and about 400 feet east of South College avenue. A stake 9 paces south of the north fence, and 8 paces east of the corner back from Delaware avenue, marks the exact point.

Sussex County, Cape Henlopen, 1885.—The station is located among the sand hills west of United States Signal Service tower and Cape Henlopen Light-House; 336 feet from the former and 709 feet from the latter.

Sussex County, Dagsboro, 1899.—The station is 500 yards north of Pepper Creek Ditch bridge, 110 yards back from the road on a line at right angles to the road, between the second and third houses from Lingo and Lingo's.

DISTRICT OF COLUMBIA.

Washington, 1901.—The small magnetic observatory in the yard adjoining the Coast and Geodetic Survey Office.

FLORIDA.

Alachua County, Gainesville, 1900.—Observations were made over a point on the campus of the seminary, across University street. This point is directly in front of the center of the dormitory, near the south side of the campus, 32 feet from East Church street, 101½ feet from University street, and 97½ feet from the street on the east side of the campus. It is also about 1200 feet north and 500 feet east of the court-house building. The mark or range used was the spire of the Baptist church. This mark or range bears 5° 11′.6 west of true south.

Brevard County, Bell, 1883.—The station is on the west shore of Indian River, 4 meters west of the shore line, 70 meters south of the mouth of Taylor Creek, and 570 feet east of Mr. Alexander Bell's house. It is marked by a block of coquina.

Columbia County, Lake City, 1900.—Observations were made over a point in the open lot two squares west of the court-house. This point is distant 141, 80, and 110 feet, respectively, from the north side of the street north, from the west side of the street west, and from the Catholic church southeast of this point. A stub was driven close against the fence on the south side of the second street south of station to mark the true meridian. The mark or range used was the belfry of the Episcopal church. This mark or range bears 1° 57′.6 west of true south.

Dade County, House of Refuge No. 2, 1883.—The station is upon the ocean side of Hutchinson Island, about 9 meters from the sea wall and 18 meters north of the northeast corner of the house of refuge. It is marked by a coquina stone 6 inches square, projecting about 6 inches above the ground.

Dade County, Hills, 1884.—The station is on the north side of Hillsboro Inlet, on the bluff that runs down to the inlet, about 25 meters from the end and some 25 meters from the high water line on the outside beach. Mr. Steve Andrews, keeper of the House of Refuge No. 3, knows the locality. It is marked by a coquina stone 6 inches square, projecting about 4 inches above the ground.

Dade County, Spencer, 1884.—The station is on the northern one of the three shell mounds, known as "Spencer Hill," on the east shore of Lake Worth. It is about 75 meters back from the ocean bluff and 25 meters north of the 20-mile post from House of Refuge No. 3. It is on land owned by Mr.

FLORIDA—Continued.

Spencer, and the location of the station is well known to him. It is marked by a coquina stone 6 inches square, projecting about 4 inches above the surface of the ground.

Duval County, Baldwin, 1900.—Observations were made over an oak peg located nearly in line with the west side of Center street. It is distant 48 feet from the fence at the east side of Center street and 134 feet north of the north side of Moody street. Baldwin Triangulation Station is on the edge of the railroad track, just west of the railway eating house at Baldwin. The latitude and longitude of this peg, as reduced from this triangulation point of the transpeninsula triangulation, are: Latitude, 30° 18′.2 north; longitude, 81° 58′.4 west of Greenwich. The mark or range used was the lightning rod on the chimney of the two-story house on the west side of Center street. This mark or range bears 5° 29′.4 west of true south.

Duval County, Jacksonville, 1900.—Observations were made over an oak peg located inside the race track of the Jacksonville Driving Club, which is at the northwest corner of the intersection of Hogan street and Eighth street, known as the shell road. This peg is a little east of the center of the inclosure, in line with the west end of the grand stand, and 202 feet north of the fence inside the race track. It is about 320 feet north of Eighth street and 425 feet west of Hogan street. The mark or range used was the pinnacle of the water tower showing just east of the grand stand. This mark or range bears 10° 52′ east of true south.

Escambia County, Devils Point, 1894.—The station is about 100 yards from the end of Devils Point, on land owned by Dr. Brosenham. It is near the corner of a picket fence. It is marked by a drain tile filled with cement.

Escambia County, Pensacola Navy-Yard, 1900.—Observations were made over a pine stub, 200 feet east of the east face of the chapel at the Pensacola Navy-Yard, 116 feet from the fence west of this peg, and 176½ feet from the fence north of it. Two thumb tacks were driven to mark the true meridian line, one on the top rail of the fence to the north, and the other in the sill of the east window of the dynamo room, to the south of this peg. The stub is distant 19 feet from a live oak tree, a little west of south of it. The mark or range used was the northwest corner of a small two-story building, No. 14, at the corner of South and Center avenues. This mark or range bears 27° 31′.2 west of true south. The center of the navy-yard chimney bears 8° 15′.2 west of true south. The navy-yard flag pole bears 34° 25′.7 west of true south.

Hillsboro County, Tampa, 1887.—The station is in the southeast corner of the court-house square. It is marked by a wooden stub 11 feet from the Lafayette street fence and 15.5 feet from the Monroe street fence.

Jackson County, Marianna, 1900.—Observations were made over an oak peg located in the large lot in the rear of the house of Mr. Finlayson and northwest of the railroad station. The peg is about the middle of this lot, at the foot of the steepest slope of the hill. It is distant 186 feet from the fence of the pear orchard to the east, 230 feet from the property of Mr. Merritt to the west, 166 feet from the corner of Mr. Finlayson's shed, and about 500 feet from the railroad. The mark or range used was the east gable of the house on the hill beyond the railway. This mark or range bears 4° 23′.6 west of true sonth.

Leon County, Tallahassee, 1900.—Observations were made over an oak peg located in the grounds of the West Florida Seminary. It is on the north side of the seminary grounds, 50 feet from McCarty street and 277 feet west of the street west of this peg. The mark or range used was the northeast corner of the seminary building, the stone top of the foundation, about 225 feet distant. This mark or range bears 46° 39′ east of true south. The center of the tower of the court-house bears 79° 49′ east of true south.

Levy County, Cedar Keys, 1900.—Observations were made over the same point used for observations in 1887, east of the Suwanee House and 34 meters due south of the Transit of Venus pier. The point is marked by a hard-pine peg. The mark or range used was the southeast corner of the fish house on the wharf. This mark or range bears 7° 24′.9 east of true south.

Madison County, Madison, 1900.—Observations were made over an oak peg driven flush with the ground, located in the park north of the court-house, just east of the band stand. It is distan 62.5 feet from the east fence 98.2 feet from the south fence, and 29.5 feet from the band stand. Another peg was set about 5 feet true south from the south line of the court-house grounds and

FLORIDA—Continued.

about 15 feet from the standpipe. The mark or range used was the northwest corner of the court-house. This mark or range bears 14° 22′.5 west of true south. The tangent to the east side of the standpipe bears 5° 08′.5 east of true south.

Monroe County, Key West, 1896.—The station is in the grounds of the Key West barracks, at the extreme northeast of the town, on the shore. It is in line with the east side of the hospital building. It is distant 24.12 and 30 meters, respectively, from brick posts at the northeast and northwest corners of the porch of the hospital, also 20.9 meters from the north fence of barracks.

Nassau County, Fernandina, 1900.—Observations were made over a hard-pine stub, on a hill about 1 200 feet north of Main street and three-fourths of a mile west of Amelia Island light-house. This peg is 55 feet south of the remains of a hedge, 300 feet north of the second street north of the main street, and about the same distance east of the street running north, by the water works. The mark or range used was the west edge of the standpipe. This mark or range bears 20° 41′.6 east of true south. The court-house bears 63° 22′ west of true south.

Putnam County, Palatka, 1900.—Observations were made over an oak peg situated on a vacant lot overlooking the river, at the corner of Hotel and River streets. This peg is 180 feet northwest of the fence line of River street and 133½ feet southwest of Hotel street. The mark or range used was the outer edge of outer pile on the end of a lumber wharf. This mark or range bears 11° 59′.3 east of true south.

St. Johns County, St. Augustine, 1900.—Observations were made over a hard-pine peg located in the grounds of Fort Marion, about 350 feet nearly north of the city gates. The peg is distant 169 feet and 130 feet, respectively, from a fence west and from a fence north of it. The mark or range used was the southwest corner of the fort. This mark or range bears 41° 01′.9 west of true south. The ball on the western gate bears 10° 19′.1 west of true south.

Santa Rosa County, Lindsay, 1894.—The station is on the west shore of Blackwater Bay and 20 feet outside of the fence line of Mr. Lindsay's land. It is marked by a 4-inch screw pile 6 feet long, projecting 4 inches above the surface of the ground.

Santa Rosa County, Mill Point, 1894.—The station is on the northern one of the two points at the entrance of East River into East Bay, called Millers Mill Point. It is 150 feet from the two cedar trees at the end of the point and 50 feet inside of high-water line.

Santa Rosa County, Pond, 1895.—The station is on the south one of the two points at the entrance of East River into the bay. It is on the beach, 10 feet from high-water mark and 20 feet from the bayou running back of the point. It is marked by a 4-inch drain tile filled with cement and set so as to leave about 4 inches projecting above the surface of the ground.

Santa Rosa County, Sand String, 1894.—The station is located on the east side of Escambia Bay on a string of hard sand which separates the bay from a large salt marsh. Marked by a drain tile filled with cement.

Santa Rosa County, Shield Point, 1893.—The station is on the west shore of upper Blackwater Bay, on the point of the same name. It is about 15 feet inside of the high water line and about the same distance from a bluff which rises just back of the shore. It is marked by a 4-inch drain pipe filled with cement and set in the ground so as to leave about 6 inches project.

Taylor County, Perry, 1900.—Observations were made over a hard-pine peg located in an open lot a short distance northeast of the court-house. This peg is approximately 7 feet north and 52 feet east of the street lines. This lot is 1 square east of the court-house square, and the street south of it runs along the northern edge of the court-house square. The mark or range used was the east gable of a small shed. This mark or range bears 1° 24′.2 east of true south. The pole on the court-house bears 69° 14′.2 west of true south.

Walton County, De Funiak Springs, 1900.—Observations were made over a pine stub located in the grounds of the Chautauqua Association. It is placed nearly in line with the east end of the Chautauqua Hotel, about 50 feet from the lake and 227 feet from the street. It is distant 23 feet south of the nearest oak tree and about 350 feet from the railroad station. A stake was set on the opposite side of the lake to mark the true meridian line. Mr. Stevens, a local surveyor, knows the exact location of these stakes. The mark or range used was the cross on the church belfry. This mark or range bears 30° 25′ west of true south.

GEORGIA.

Baldwin County, Milledgeville, 1900.—Observations were made over a peg driven flush with the ground, located in the old capitol grounds, which are now the grounds of the Middle Georgia Military and Agricultural College. This peg is distant 81 feet 4 inches and 124 feet, respectively, from the fence east and from the street south of the point. It is also distant 26 feet 5 inches and about 275 feet, respectively, from a tree northwest of the peg and from a corner of the old capitol building. The mark or range used was the center of the dome of the State asylum. This mark or range bears 5° 02′.8 east of true south. The spire of Trinity church bears 68° 13′.7 west of true south. The northwest corner of the capitol building bears 5° 25′.8 west of true north.

Bibb County, Macon, 1900.—Observations were made over a point in Central City Park. This point is inside of the race track, about 175 feet from the track and directly in line between the middle door of the main exhibition hall and the east flag pole on the stand west of the track. The point is nearly in line with the prolongation of Walnut street. The mark or range used was the east flag pole on the stand west of the race track. This mark or range bears 0° 59′.6 east of true south.

Chatham County, Savannah, 1895.—The station is on Hutchinson's Island, opposite Savannah, in range of the steeples of the Exchange and the Presbyterian church. It is in a cluster of large pine trees just south of the second embankment parallel to the river.

Dougherty County, Albany, 1900.—Observations were made over an oak tent peg, driven flush with the ground, located in the court-house grounds, near its north end. It is distant 15.6, 41.6, 58, and 152 feet, respectively, from the footpath east, from the fence north, from the fence west, and from the northwest corner of the foundation of the court-house building, south of this peg. The mark or range used was the base of the flagstaff on the Mayer & Grine building. This mark or range bears 28° 40′.7 east of true south. The northwest corner of the court-house building bears 1° 55′.3 west of true south. The base of the flagstaff on the New Albany Hotel bears 34° 38′.8 west of true south.

Floyd County, Rome, 1896.—The station is in the southwestern suburbs of the city, in the center of a knoll near the intersection of Pennington avenue and Cemetery street. It is marked by a yellow pine post sunk two feet in the ground, flush with the surface of the ground. The post is distant 75 feet from a line of breastworks built around the knoll. It is also distant 60 feet from a blazed pine tree and about 250 yards from the intersecting streets.

Fulton County, Atlanta, 1896.—The station is located in the southeast part of the city, in the southwest corner of the L. P. Grant park. It is marked by a hard pine stub driven flush with the surface of the ground. It is in a level oval lawn, graded ground, with hills east and west. It is distant 15 meters from the center of a double gum tree and almost due north 23.4 meters from a poplar tree at the south side of the park.

Glynn County, Brunswick, 1887.—The station is in the large open square at the corner of Gloucester and Newcastle streets, west of the corner. It is distant 50 meters and 30 meters, respectively, from the outer edge of the curbstones along Gloucester and Newcastle streets.

McIntosh County, Cedar Point, 1902.—The station is on the property of Capt. W. H. Atwood, known as Cedar Point Plantation. It is about 20 meters north of a small gully just north of the residence of Captain Atwood, about 10 meters back from the creek bank, on the edge of a clump of small cedars.

Macon County, Oglethorpe, 1900.—Observations were made over a tent pin, driven flush with the ground, located on the square bounded by Sumter, Cuyler, Anderson, and Macon streets, in the open space in the rear of the Baptist church. The point is about 1 000 feet northwest of the court-house building. It is distant 55, 87, 103, and 160 feet, respectively, from the line of the south side of the church, from the line of Anderson street, from the line of Macon street, and from the east corner of the church. The mark or range used was the center of the cupola of the schoolhouse building. This mark or range bears 25° 34′.4 west of true south. The center of the court-house cupola bears 28° 43′.6 east of true south. The east corner of the foundation of the church bears 70° 06′.4 west of true south.

Mitchell County, Pelham, 1900.—Observations were made over an oak tent peg, located in an open field belonging to G. P. Hand, three squares west of the railroad. It is distant 88 feet south of the street line and 165 feet west of the street line and 400 feet north of the Baptist Church. The mark

GEORGIA—Continued.

or range used was the northeast corner of the foundation of the Baptist church. This mark or range bears 10° 02′.2 east of true south.

Richmond County, Augusta, 1900.—Observations were made over an oak stub driven flush with the ground, located in May Park, at the eastern end of the city, between Third and Fourth streets and Watkins and Calhoun streets. This peg is near the middle of the west side of the park, 3 134 feet east of the post-office and is 2 903 feet south of the post-office. It is distant 25 feet and 9 inches, 49 feet, 17 feet and 11 inches, 79 feet, and 49 feet, respectively, from a walk west, from a fence west, from a walk east, from a magnolia tree northeast, and from a magnolia tree south of this peg. The mark or range used was the edge of a house chimney. This mark or range bears 34° 27′.2 west of true south. The vane on the church spire of the Thankful Baptist church bears 61° 03′.7 east of true north.

Thomas County, Thomasville, 1900.—Observations were made over an oak peg driven flush with the surface of the ground, located in the grounds of the Piney Woods Hotel. This peg is located in the north side of the grounds, directly across the street from the Randall House, almost in line between the southwest corner of the Randall House and the northwest corner of the Piney Woods Hotel. It is distant 59.6, 55.5, and 172.8 feet, respectively, from the north fence of these grounds, from the nearest point on the board walk east of the peg, and from the northwest corner of the Piney Woods Hotel. The mark or range used was the northwest corner of the base of the central projection of the Piney Woods Hotel. This mark or range bears 39° 04′.6 east of true south.

Warren County, Warrenton, 1900.—Observations were made over a point located in the park in which are situated the Baptist church and the public school. It is northwest of the church and is southwest of the schoolhouse. This point is distant 42 feet 6 inches from a stone post northwest of it. It is also distant 110 feet 6 inches and 147 feet, respectively, from the northwest corner of the Baptist church and from the southwest corner of the schoolhouse. The mark or range used was the northwest corner of the first house from the west on the south side of the park. This mark or range bears 6° 48′.8 west of true south.

Ware County, Waycross, 1887.—The station is on the edge of the woods north and west of the Grand Central Hotel, west of the Atlantic Coast Line station. It is about 34 meters west of the north and south street passing along the west side of the Grand Central Hotel and on the prolongation of the center line of the first street north of the hotel.

Wayne County, Jesup, 1887.—The station is in the northwest corner of the large garden in the rear of the Altamaha Hotel, a railroad hotel. It is distant 10 and 20 meters, respectively, from the northwest and southwest fences around the garden.

HAWAIIAN ISLANDS.

Hawaii Island, Kilauea, 1900.—Near the triangulation stone opposite the "Volcano House," Kilauea, 94.2 feet, 53° 06′ east of true south of northeast edge of triangulation monument. Bottom of flagstaff on the hotel bears 17° 14′ west of true north from magnetic station.

Hawaii Island, Napoopoo, 1892.—With the aid of a map and verbal instructions at the Government Survey Office in Honolulu, Mr. Preston was able to find the spot where the great navigator, Cook, had his observatory in 1779, and the magnetic instruments were placed practically in the same locality.

Hawaii Island, Kalaieha, 1892.—Kalaieha is situated on the Humuula ranch, which contains 237 000 acres, including a part of Hamakua. The tract runs down to the sea on the windward side, and extends from the summit of Mauna Loa on the south to Mauna Kea on the north. The pendulum receiver was mounted on a large rock about 100 feet west of the house farthest to the west, and the latitude pier was within 2 or 3 feet of the pendulum in a southeast direction. The magnetic station was 200 feet due north of the pendulum. A general view of Kalaieha is shown in illustration No. 32, Appendix 12, Report for 1893.

Hawaii Island, Hilo, 1900.—The magnetic station at this port is the triangulation station "Mokuola" near the northern end of Cocoanut Island, which is used by the health authorities as a quarantine station. The station is marked by a granite block set in a triangular foundation of concrete about 4 feet on a side and 18 inches above the ground. The foundation is inscribed "Bureau of Public Lands. A. B. Lobenstein 1896," and has one apex pointing toward true north. This station was

HAWAIIAN ISLANDS—Continued.

occupied by Assistant E. D. Preston in July and August, 1892, and by several previous observers. The entire island and coast in this vicinity is magnetic lava rock, making the exact location of an old station essential.

Hawaii Island, Waiau, 1892.—On the banks of Lake Waiau (on the summit plateau of Mauna Kea), 125 feet west of Mr. Preston's latitude station and about 20 feet from the water's edge; elevation about 13 000 feet. See Appendix 12, Report for 1893.

Hawaii Island, Waimea, 1892.—One station was at the west end of the base line of the Government survey at this place, and the other was identical with the station occupied in 1872 by Mr. C. J. Lyons, near his homestead.

Hawaii Island, Kawaihae, 1892.—Situated on the property of the Hon. Samuel Parker, between the boat landing and the Heiau of Kamehameha Island, and about one-third the distance from Heiau. The magnetic station was about 20 yards southeast of the latitude station. For precise situation, see Appendix 12, Report for 1893.

Maui Island, Lahaina, 1900.—The station of 1900 is the same as that of 1892, occupied by Mr. Preston, viz, on the lawn in the rear of the court-house, 92 feet from the north corner of the court-house and 110 feet from the east corner of the barn with stucco walls. The dip circle was shifted a few feet from its old position in 1892 in order to secure the shade of a large banyan tree and some mangoes, so that it was distant from the magnetometer station 58.5 feet, and bears 130° 19′ east of true north.

Maui Island, Kahului, 1899. The magnetometer was on the first prominent sand dune (about 6 or 7 feet high) east of Kahului, and about 200 feet back from the beach, in range with the north end of the ridge of a dwelling used by company employees, and lowest angle visible in Iao Valley. The dip circle was in a small hollow on southeast side of same mound and on range with south end of ridge of same dwelling and lowest angle in sky line of Iao Valley. The magnetometer station was marked by a subsurface mark of a bottle in cement and a similar surface mark. The soil is a coral sand, covered with sparse grass and vines, sufficient to prevent drifting. The station is well above the highest seas, and apparently free from all disturbing influences. The position of the dip circle was marked by a wooden stub. It is 3 feet east of line from magnetometer to two chimneys of pumping station across the lake.

Oahu Island, Waikiki, 1891.—The station was situated near the astronomical observatory for latitude observations and on the property of Mr. J. F. Brown, the precise point being 90 feet south of center of observatory and 18 feet west of it.

Oahu Island, Honolulu, 1900.—In the public yard near the Government survey building. The precise point is marked by a wooden stake with a nail in the top of it and can be pointed out by members of the Hawaiian survey office. The azimuth mark is the triangulation mark on Punch Bowl, the geodetic azimuth of which, according to Prof. Curtis J. Lyons, is 55° 19′.5 east of true north.

Oahu Island, Sisal, 1900.—Sisal is the first railroad station on the Oahu Railroad west of Eva Mill station. The immense coral plain, on the south side of Oahu Island, between Pearl Harbor and Barbers Point (Kalaeloa Point), extends at this point to the railroad and somewhat beyond.

The first station (A) was situated near the highest point, about a half mile south of the railroad track, the place being known as "Jim's Hill." The station was marked by a stake with stones piled around it. Nothing but coral rocks on all sides, with practically no stratum of soil.

The second station was in the back yard of Mr. Turner, manager of the Sisal plantation, and is marked by a hole drilled in a large coral rock projecting a few inches above the ground.

Oahu Island, Sisal, Coast and Geodetic Survey Magnetic Observatory, 1901.—The observatory is situated about three-fourths of a mile south of the house at Sisal Railroad station, occupied by Mr. Turner, manager of the Sisal plantation. Mr. J. A. Fleming made magnetic observations at a number of points in this vicinity, in addition to those of Dr. L. A. Bauer, in order to determine the most suitable site of the magnetic observatory. The principal station at Sisal is of course the magnetic observatory.

Oahu Island, Puuloa Point, entrance of Pearl Harbor, 1900.—The station is in the yard back of the abandoned salt works at the entrance of Pearl Harbor. The precise point is marked by a stake 114.7 feet, 47° west of true north, from center of triangulation pier, 37.5 feet from northeast corner of lot as marked by wooden fence, 23 feet from east fence, and 29.4 feet from north fence.

HAWAIIAN ISLANDS—Continued.

The brick pier is the same as used by Mr. Preston for his latitude observations in 1887. The geological formation consists of sand covering coral rocks.

Oahu Island, Puuloa Railroad Station, 1900.—In the field south of waiting station and about 150 yards from the track. The observations were made at this point on the way to Puuloa Point (entrance of Pearl Harbor). Soil not adapted for plantation purposes and overgrown at present with prickly bushes and stunted algoroba trees.

Oahu Island, Honouliuli Ranch, 1900.—The location of this station can best be seen by reference to the map of the Eva Mill plantation. The ranch can be reached either from railroad station Honouliuli, and directions given at the ranch house, or from Eva Mill station, and the necessary directions obtained from the office of the Eva Mill plantation. On the map the field in which the observations were made is bounded on the west by section C, on the north by sections A and B, and on the south by sections A and C. An avenue leads from the pump house south across the railroad track, thence between the cane plantations, and passes the ranch field on the west side of the field at somewhat less than one-half mile from the railroad track. This field is very stony and has but a thin stratum of red soil on it, is covered at present by algoroba trees and bushes, and used only for grazing. Station B was placed in line with Station A and a distant peak, the two stations being about 200 yards distant from each other, and were occupied by Dr. L. A. Bauer mainly for the purpose of determining the most suitable magnetic observatory site.

Oahu Island, Kahuku Ranch, 1900.—Situated in the yard on the north side (i. e., toward the railroad track) of the dwelling house occupied by the manager of the Kahuku Ranch, about half way between northeast edge of house and northwest corner of stone wall of yard, 4 paces west of algoroba tree and 23 paces east of west stone wall.

The precise spot has been marked by a stone set flush with the ground with a hole drilled in the middle, the center of the hole being 73.82 feet from northeast edge of the spring house, 112.48 feet from northwest edge of small extension to dwelling house, and 145.32 feet from northeast edge of house.

Kahuku Ranch is about 4 miles this side of present terminus of Oahu Railroad, which is called Kahuku station. The geological formation appears to consist almost entirely of coral layers. This station is doubtless within a few feet of that of Mr. E. D. Preston as occupied by him in November, 1891.

Niihau Island, Nonapapa, 1892.—The station was 350 feet distant from the large crane at the steamer landing, the direction from the crane to the magnetic station being 18° east of south.

Kauai Island, Waimea Bay, 1892.—The first station, A, was made near the old Transit of Venus station, occupied by the English party in 1874, and reoccupied by Mr. Preston, in 1887, while determining astronomical latitudes for the Hawaiian Government. As it was feared that local attraction might have influenced the work at the preceding station, a second station was made at Thornycroft. This station was designated as Waimea "B," and is situated nearer the sea, on a level piece of land, with no rocks in the immediate neighborhood. It is on what is known as the Rowell property, and is about one-eighth of a mile west of the house. The station is 1 015 feet north and 2 828 feet west of the Transit of Venus pier. This is taken from a large scale map made by Mr. William Rowell, and is correct within a few feet.

ILLINOIS.

Cook County, Chicago, Old University, 1888.—The station is in the grounds of the old Chicago University, 45.5 yards from the fence along the College Place street, and 31.8 yards east of the fence along Rhodes avenue. It is marked by a stub sunk flush with the surface of the ground.

Cook County, Chicago, near water tower, 1891.—The station is in the vacant grounds north of the waterworks grounds at the foot of Chicago avenue. It is about 625 feet north and 230 feet east of the stone water tower.

Cook County, Chicago, Lincoln Park, 1900.—The station is near the south end of Lincoln Park, between the athletic field and the lake. It is 123 feet from the southeast end of the lagoon (measured from the topmost stone of the embankment) and 123½ feet southwest from the lake-shore driveway. It is marked by a post of Bedford stone, 6 inches square, lettered on top U. S. C. & G. S., and sunk

ILLINOIS—Continued.

6 inches below the surface of the ground. The mark or range was a church spire, and bears 87° 35′.3 west of true south.

Hamilton County, McLeansboro, 1900.—The station is in the town cemetery, about 300 feet southeast of the northwest corner. It is in the middle of a drive running north and south. It is 12.7 feet south and 27 feet east of the southeast corner of the Morris lot. It is marked by a white limestone post of cross-section, 4 inches by 8 inches, and lettered U. S. C. & G. S. This stone is sunk 2 inches below the surface of the ground. The mark or range used was the spire on the Catholic church, and bears 39° 54′ west of true north. The tip of the town water tank bears 59° 45′.4 west of true north.

Lasalle County, Ottawa, 1891.—The station is in the southwestern quarter of the city in the Ottawa cemetery. It is on the bluff just over the river in what would be the center of the road which runs through the Catholic section of the cemetery if the road were extended to the edge of the bluff. It is between the "Matthews section" on the east and the "Simon section" on the west. It is marked by a drill hole in a dressed limestone post sunk flush with the surface of the ground. The cupola of the Ottawa flour mill bears 63° 22′.1 east of true north.

McLean County, Bloomington, 1891.—The station is in the northwest corner of the grounds of the Illinois State Normal University, 60 feet south of the north fence and 141.2 feet east of the west fence. It is marked by a drill hole in the top of a limestone post projecting 4 inches above the ground, and lettered on top U. S. The spire on the main building of the university bears 44° 30′.5 east of true south.

Marion County, Sandoval, 1896.—The station is located in St. Lawrence Catholic churchyard, 35.8 feet northeast of the northeast corner of St. Lawrence Catholic church, and 17 feet west of the plank fence on the east side of the churchyard. It is marked by a pine stub.

Sangamon County, Springfield, 1891.—Observations were made over the intersection of the grooves in the top of a limestone post 7½ inches square, lettered on top U. S. C. S., and sunk flush with the surface of the ground. This stone is in the southeast corner of the grounds of the Lincoln monument, quite near to the eastern one of the line of evergreen trees planted at right angles to the road leading to the monument. The tree nearest the station is a Norway spruce. It is next to the road leading to the cemetery proper. The tip of the ear of horse on the cavalry group on monument (only one ear shows) bears 27° 34′.5 west of true north.

Vermilion County, Danville, 1900.—The station is near the southwest corner of the grounds of the National Soldiers' Home, about two miles east of the center of the town, over the south stone of the meridian line. This is a limestone post 3½ feet long by 8 inches square, lettered on top U. S. C. & G. S. It is 30 meters north of the center of the public road, which runs by the south side of the grounds, and is also 29 meters east of the west line of this property. The north meridian stone is similar and similarly lettered, 429.7 meters distant. The mark or range used was the flagstaff on the center of the roof of the headquarters building, and bears 3° 18′.9 west of true north.

Washington County, Nashville, 1900.—The station is located in the Masonic cemetery, in the drive north of block 6. It is on the south side of the drive, 55 feet west of the northeast corner of the block. It is marked by a white limestone post, 6 by 8 inches, and lettered on top U. S. C. & G. S. The mark or range used was the flagstaff on the schoolhouse, and bears 21° 36′ west of true north. The German Presbyterian church spire bears 13° 30′.8 east of true north.

Winnebago County, Rockford, 1891.—The station is in the large open space in Cedar Bluff Cemetery, 23.6 feet from the northern fence, and would be 4 feet east of the eastern edge of the central road which runs through the cemetery if it was extended to the northern boundary of the cemetery. It is marked by a dressed limestone rock, lettered U. S. on top, and sunk flush with the surface of the ground. The center of the Hughston tombstone bears 17° 03′.5 east of true south.

INDIANA.

Allen County, Fort Wayne, 1900.—Observations were made over a stone post 6 by 6 inches on top and 3 feet long, set 31 inches in the ground. The top of this post is lettered U. S. C. & G. S., with a cross in the center of it. The center of this cross marks the point. This stone post is located in a pasture field owned by Mr. Christian F. Pfeiffer, about 1½ miles north of the court-house. It is reached by going out the Goshen road past the Catholic Orphans' Home. It is distant 405 feet from

INDIANA—Continued.

the north fence of this pasture field, in line with two trees west of the post, and in line with the Catholic Orphans' Home east of the station. It is distant 205 feet from the first of the two trees west of the station, and 33.6 feet from a large stump southwest of this stone. Archer avenue is south of this pasture field. The mark or range used was the cross on a tall church spire, St. John's Lutheran Church. This mark or range bears 0° 05′.4 east of true south. The spire of the Indiana State Institute for the Feeble Minded bears 81° 37′.8 east of true north.

Blackford County, Hartford City, 1900.—Observations were made over a stone post 8 by 8 inches on top and 3 feet long, set 26 inches in the ground. The top of this stone is lettered U. S. C. & G. S., with a cross in its center. The center of this cross marks the point. It is located on the farm of Mr. Charles A. Clouser, about 1½ miles northwest of the court-house. This post is in a small pasture west of Mr. Clouser's house. It is distant 308, 180, and 234 feet, respectively, from the east, the west, and the north fences around this pasture field. It is 16.7 feet south of a small tree. The mark or range used was the tip of the court-house tower. This mark or range bears 34° 30′.3 east of true south. The tip of the cupola on a small barn near the stone post bears 0° 30′.4 west of true south.

Decatur County, Greensburg, 1900.—Observations were made over a stone post 7 by 7 inches on top and 3 feet long, set about 2 feet in the ground. The top of this stone is lettered U. S. C. & G. S., with a small cross in its center. The center of this cross marks the point. This post is located on the county poor farm, about 6 miles north of Greensburg and one-half mile southwest of Sandusky, a small railway station. It was placed on a small knoll in a small field east of south of the main building. It is north of a tree and fence. The mark or range used was a small ventilator on the north (right hand) end of Mr. Mieler's barn, near the post. This mark or range bears 66° 57′.5 west of true south. The church spire at Sandusky railway station bears 33° 37′.0 east of true north.

Greene County, Bloomfield, 1900.—Observations were made over the center of a stone post 6 by 8 inches on top and 3 feet long, set about 28 inches in the ground. This post is located on the county poor farm, about three-quarters of a mile east of the court-house at Bloomfield. It was set in the northwest corner of the farm, near the top of a small hill. It was placed on the highest ground available. It is near a rail fence, and is north of the orchard and the Bloomfield road. The mark or range used was the back gallery post of the house on the hill nearly south of this post. This mark or range bears 35° 06′.9 west of true south. A prominent red granite monument on the highest part of Cemetery hill bears 83° 22′.1 west of true north.

Howard County, Kokomo, 1900.—Observations were made over a stone post 6 by 7 inches on top and 3 feet long, set 2 feet in the ground. The top of this stone is lettered U. S. C. & G. S., with a small cross in the center. The center of the cross marks the point. This post is located on the county farm, which is about 1½ to 2 miles west of the court-house at Kokomo. It is located in what is known as the "blue-grass pasture," a little east of north of the poor-house building and about three-eighths of a mile from it. This post is 18 feet north of a large black stump about 3 feet in diameter, and approximately in line with the center of this stump and the main building of the poor farm. The court-house can be seen through a narrow gap in the timber to the eastward. The mark or range was the lightning rod on the east end of the poorhouse barn. This mark or range bears 14° 15′.6 west of true south. The flagstaff on the court-house bears 62° 42′.7 east of true south.

Jefferson County, Madison, 1900.—Observations were made over a stone post 6 by 6 inches on top and 3 feet long, set about 2 feet in the ground. The top of this post is lettered U. S. C. & G. S., with a small cross in the center of it. The center of this cross marks the point. This post is located on the campus of Hanover College, about 6 miles from Madison in a westerly direction. This post is set about 100 feet from the College Observatory, between it and the main building, west of the athletic field and tennis court. The mark or range used was a small post on the right-hand side of the dome of the main college building. This mark or range bears 76° 09′.6 east of true south. The center of a small cross on the nearest college building bears 78° 56′.5 east of true south.

Knox County, Vincennes, 1896.—The station is in the large open space on the west side of the Catholic cemetery west of the city. It is 126 feet from the plank fence on the southeast side and 72 feet from the fence on the southwest side of the cemetery. It is marked by an oak stub.

Kosciusko County, Warsaw, 1900.—Observations were made over a stone post 7 by 7 inches on top and 3 feet long, set 3 feet in the ground. The top of this post is lettered U. S. C. & G. S., with a

INDIANA—Continued.

cross in the center of it. The center of this cross marks the point. This post is located on the county poor farm, about 2 miles south of Warsaw. It is on the lawn in front and west of the main building, and a little south of the main entrance. It is distant 166.2, 184.5, and 246 feet, respectively, from the south side of the entrance arch of the main building, from the south fence, and from the west fence of the inclosure in front of the main building. The mark or range used was the lightning rod on the central cupola of Jim Russ's barn. This mark or range bears 11° 34′.3 east of true south. The tip of the cupola on the East Ward School building bears 4° 09′.5 west of true north.

Laporte County, Michigan City, 1900.—The station is in the park to the south of the Marsh schoolhouse, to the south of the town. It is marked by a limestone post 7 inches square, lettered U. S. C. & G. S., and set with its top a few inches below the surface of the ground It is 102.5 feet to the nearest edge of the sidewalk on the south side of Baker avenue (to the south) and 74 feet to the line of east wall of the schoolhouse (to the west). The northeast edge of the schoolhouse bears 9° 01′.8 west of true north.

Marion County, Indianapolis, 1900.—Observations were made over a stone post 6 by 6 inches on top and 3 feet long, set 2 feet in the ground. The top of this post is lettered U. S. C. & G. S., with a cross in the center of it. The center of this cross marks the point. This post is located in Riverside Park, about 5 miles northwest of the court-house. It is near the break of the hill in the western part of the park, about 200 yards north of Thirtieth street. It is distant, respectively, 45, 42, and 18 feet from three trees, and is northwest of the bear cage. The mark or range used was the center of the head of the figure on the soldiers' monument. This mark or range bears 37° 06′.5 east of true south. The steeple of a small church bears 73° 51′.6 west of true south.

Montgomery County. Crawfordsville, 1900.—Observations were made over a stone post 6 by 6 inches on top and 3 feet long, set in the ground about 26 inches. The top of this post is lettered U. S. C. & G. S., with a cross in the center of it. The center of this cross marks the point. This post is located on the county farm about 1 mile north of town. It is placed in a small field in front and southwest of the poorhouse on the west side of the road from Crawfordsville. It is distant 144 and 60 feet, respectively, from the east and north fences inclosing this small field, and is just south of the orchard. The mark or range used was the weather vane on a small white barn just south of this stone post. This mark or range bears 0° 30′.2 west of true south. The tip of the cupola on the Fiskville schoolhouse bears 5° 58′.2 east of true south.

Morgan County, Martinsville, 1900.—Observations were made over a stone post 8 by 8 inches on top and 3 feet long, set about 26 inches in the ground. The top of this stone is lettered U. S. C. & G. S., with a cross in the center of it. The center of this cross marks the point. This post is located on the county poor farm, about 1½ miles east of the court-house at Martinsville. It is placed in a field across the road from the main building, about 200 yards northwest of it. It is located on a small knoll near the south bank of a small stream, 10 feet distant from the edge of this bank. It is also distant 35, 45, and 75 feet, respectively, from three trees near an old barn. The mark or range used was the underside of the north gable of a red house just south of the stone post. This mark or range bears 8° 41′.8 west of true south. The northeast corner of the poor farm building bears 23° 35′.9 east of true south.

Orange County, Paoli, 1900.—Observations were made over a stone post 6 by 6 inches and 3 feet long, set 2 feet in the ground. The top of this stone is lettered U. S. C. & G. S., with a cross in the center of it. The center of this cross marks the point. This post is located on a bald hill northeast of the public-school building, and about 300 or 400 yards distant from it. This hill is about three-fourths of a mile east of the court-house at Paoli, and is the property of the Thomas Hunt estate. The mark or range used was the tip of the post on the cupola of the brick schoolhouse. This mark or range bears 45° 01′.1 west of true south. The spire of the court-house bears 82° 40′.9 west of true north.

St. Josephs County, South Bend, 1900.—Observations were made over a stone post 6 by 6 inches on the top and 3 feet long, set about 34 inches in the ground. The top of this stone is lettered U. S. C. & G. S., with a cross in the center of it. The center of this cross marks the point. This post is located on the county farm, about 2 miles east of the court-house at South Bend. It is placed in a field northeast of the main building, and it was so located that the standpipe at South Bend could just be

INDIANA—Continued.

seen on the south side of the large tree west of this post. It is distant 121 feet from the nearest edge of this tree, and almost in line to a second tree on the opposite side of the field. The mark or range used was the flag pole on the building almost south of this stone. This mark or range bears 10° 47′.3 east of true south. The tall church spire at South Bend, with fancy work on spire, bears 85° 41′.3 west of true south.

Vanderburg County, Evansville, 1900.—The station is on the grounds of the Southern Indiana Hospital for the Insane, about 3 miles east of the town. It is about 600 feet south of west of the main building, on the roadside. It is marked by a white limestone post 6 inches square, lettered on top U. S. o C. & G. S., and projecting about 4 inches above the surface of the ground. The mark or range used was the middle of the foot of the flagstaff on the main building, and bears 23° 52′.5 east of true north.

Vigo County, Terre Haute, 1900.—Observations were made over a stone post 6 by 6 inches on top and 3 feet long, set about 26 inches in the ground. This post is located on the property of Mr. McKeen, a dairyman. It is about 3 miles northeast of the court-house, in a small pasture just east of Mr. McKeen's residence. This pasture is at the corner of Maple avenue and Twenty-fifth street. The stone is about 393 feet south of the edge of Maple avenue, and it is distant about 156 and 204 feet, respectively, from the south and the west fences inclosing this pasture field. The mark or range used was the spire of the orphans' home. This mark or range bears 9° 07′.8 east of true south. The steeple on the Eighteenth District School building bears 14° 06′.9 west of true south.

Wayne County, Richmond, 1900.—Observations were made over a stone post 6 by 6 inches on top, and 3 feet long, set about 2 feet in the ground. The top of this stone is lettered U. S. C. & G. S., with a cross in its center. The center of this cross marks the point. This post is located on the campus of Earlham College, about 1½ miles west of the city. It is placed in the open space in the rear and south of the college buildings, and southwest of the dormitory, in line with the last row of shade trees between the campus proper and the adjoining field. It is distant about 63, 45, and 51 feet, respectively, from three adjacent trees. The mark or range used was the right-hand edge of the chimney of Mr. Martin's house across the field south of this post. This mark or range bears 13° 12′.8 east of true south. The tip of a large monument on the southern section of cemetery bears 62° 31′.2 west of true south. The spire of the Irish church in Richmond bears 87° 38′.2 east of true north.

INDIAN TERRITORY.

Cherokee Reservation, Vinita, 1888.—The station is in a lot owned by Mr. Henry Eiffert, just south of the Congregational church, in the southwestern part of the town. It is marked by a locust post 32 feet 2 inches from the northeast corner of Mr. Eiffert's house. It is also 13 feet 1 inch and 15 feet 4 inches distant, respectively, from the north and east fences around Mr. Eiffert's property.

IOWA.

Black Hawk County, Waterloo, 1900.—Observations were made over a marble post sunk almost level with the ground and lettered U. S. C. S. The center of hole marks point. This post is located in a triangular field in front of Elmwood Cemetery, on the west side of Cedar River. It is 59.8 feet from the edge of Elmwood Cemetery road and 67.4 feet from the edge of Locust street. The mark or range used was the middle of a small round chimney on a Mr. Sign's house. Mark or range bears east of true south 28° 32′.9.

Boone County, Boone, 1900.—Observations were made over a white limestone post 3 feet long and 6 by 6 inches at the top, and lettered U. S. C. S. The center of the hole marks the point. This post is located in the new city cemetery, in the middle of the 6-foot walk, just west of lot No. 70. The top of this post is 1 inch below the surface of the ground. The center of the post is 10.2 feet and 3.2 feet, respectively, from the northwest and southwest corners of lot No. 70. The mark or range used was the Swedish church spire. The mark or range bears east of true north 4° 26′.3.

Carroll County, Carroll, 1900.—Observations were made over a white marble post 3 feet long and 6 by 6 inches square, and lettered U. S. C. & G. S. The center of the central hole marks the point. The top of this post is 1 inch below the surface of the ground. It is located in the town cemetery, in the ornamental circle in the center of which stands the G. A. R. monument, and 43.6 feet and 43.3

feet, respectively, from the southwest and southeast corners of the base of this monument. The mark or range was the center of the foot of the cross on St. Joseph's Catholic church. The mark or range bears west of true north 52° 59′.0.

Cass County, Atlantic, 1900.—Observations were made over a white limestone post 3 feet long, 6 by 6 inches square, and lettered U. S. C. & G. S. The center of the central hole marks the point. The top of this post is 1 inch below the surface of the ground. This post is located in the city cemetery, in the middle of the walk between lots No. 65 and No. 66, and on the border of the drive east of these lots, midway between the southeast corner of lot No. 65 and the northeast corner of lot No. 66. The mark or range used was the tip of the court-house tower. Mark or range bears west of true south 93° 45′.4.

Cherokee County, Cherokee, 1900.—Observations were made over a white limestone post 3 feet long and 6 by 6 inches square, and lettered U. S. C. S. The center of the central hole marks the point. This post is sunk with its top even with the surface of the ground. It is located in Oak Hill Cemetery, east of lot No. 54, block 5, and 7.8 feet and 13.0 feet, respectively, from the northeast and southeast corners of this lot. The mark or range used was the tip of the main tower on the State insane asylum. The mark or range bears 21° 06′.4 east of true north. The tip of the tower on court-house bears 87° 17′.0 east of true north.

Clarke County, Osceola, 1900.—Observations were made over a white limestone post 3 feet long and 6 by 6 inches square, and lettered U. S. C. & G. S. The center of the central hole marks the point. This post is sunk with its top 1 inch below the surface of the ground. It is located in the town cemetery, at the eastern end of the cemetery, 1 foot north of intersection of the middle of the two walks. This intersection is bounded by lots numbered 49, 50, 55, and 56. The mark or range used was the tip of the court-house tower. The mark or range bears 38° 39′.5 east of true north. The tip of schoolhouse tower bears 62° 41′.0 east of true north.

Delaware County, Manchester, 1900.—Observations were made over a white marble post 3 feet long and 6 by 6 inches square on top and lettered U. S. C. S. The center of the cross marks the point. This post is sunk level with the ground. It is located in the grounds of the Manchester High School, 150 feet back of the schoolhouse. The mark or range used is the spire of the Presbyterian church. The mark or range bears 24° 41′.9 west of true south. The northeast corner of the base brickwork of the school building bears 83° 18′.7 west of true north.

Des Moines County, Burlington, 1900.—Observations were made over a station in a vacant lot near the corner of Jefferson street and Garfield avenue. It is distant 137.7 feet from the center of Garfield avenue, 14.7 feet from a fence, and 100.6 feet and 82.5 feet, respectively, from the corners of the house in proximity of the station. The mark or range used was the tip of the steeple of the Swedish Lutheran church. The mark or range bears 26° 59′.4 west of true south.

Dubuque County, Dubuque, 1900.—Observations were made over a marble post lettered U. S. The center of the central hole marks the point. This post is sunk with its top even with the surface of the ground. It is in the grounds of Mr. J. V. Rider on Seminary Hill, in the southwest corner of the yard, near the limestone bluff. The mark or range was the spire of the Presbyterian church. This mark or range has been used before for magnetic observations; it bears 6° 04′.8 east of true south. The south spire of Catholic Sisters' school bears 87° 01′.3 west of true north.

Fayette County, West Union, 1900.—Observations were made over a gray marble post 2 feet long, 2 by 6 inches on top, and lettered U. S. The center of the central hole marks the point. This post is sunk with its top even with the surface of the ground. It is located in the city cemetery, on the north side of the main road from the entrance, at a point where a road branches to the north, in the northwest corner of the junction of the two roads. It is 51.0 feet from the McClintock monument. The mark or range is the tip of Sarah Beichtol's monument, located near the south fence of the cemetery. The mark or range bears 4° 14′.6 west of true south. The Methodist church spire bears 87° 19′.8 east of true south.

Floyd County, Charles City, 1900.—Observations were made over a white limestone post 3 feet long and 7 by 7 inches on top, and lettered U. S. C. S. The center of the central hole marks the point. The post is sunk with its top even with the surface of the ground. It is located in the grounds of Charles City College, 200 feet east by north of the college building, and 93 feet from the center of

IOWA—Continued.

the road which runs near the college building. The mark or range was the northeast corner of the chimney on the house of Mrs. N. Makepeace. The mark or range bears 64° 39′.6 west of true south. Tip of college tower bears 85° 04′.0 west of true north.

Franklin County, Hampton, 1900.—Observations were made over a white limestone post 1½ feet long, 6 by 6 inches on top, and lettered U. S. C. S. This post is sunk even with the surface of the ground. It is located in the grounds of the Hampton High School, east of the school building, and 186.4 and 200.6 feet, respectively, from the southeast and northeast corners of this building. The mark or range used was the center on the cross of the Methodist church. The mark or range bears 71° 17′.0 west of true south. Tip of schoolhouse tower bears 81° 56′.8 west of true south.

Guthrie County, Menlo, 1900.—Observations were made over a brown sandstone post 2½ feet long, 5 by 12 inches on top and lettered U. S. The center of the central hole marks the point. This post is sunk with its top 1 inch below the surface of the ground. It is located in the town cemetery, on the south side of the road leading from the gate, and about 300 feet from the gate. The point is due north of the northeast corner of the Heater lot, and measures 3.6 feet and 17.3 feet, respectively, from the northeast and northwest corners of this lot. The mark or range used was the tip of the roof at the south end of C. Ebel's house. The mark or range bears 31° 01′.8 east of true north. The upper corner of the south end of the roof of W. Galbreath's house bears 21° 39′.0 west of true north.

Hancock County, Garner, 1900.—Observations were made over a white marble slab 21 inches long, 2 by 8 inches on top, and lettered U. S. This slab is sunk with its top even with the surface of the ground. It is located in the town cemetery, on the west side of the road leading from the entrance, and about 200 feet from the entrance. The slab is near the northeast corner of lot No. 73, section 2, and is distant 7.6 feet and 24.9 feet, respectively, from the northeast and southeast corners of this lot. The center of the central hole in this slab marks the point. The mark or range used was the tip of the tower on the water tank. The mark or range bears 29° 09′.2 west of true north. The spire of the German Lutheran church bears 34° 16′.7 west of true north.

Hardin County, Eldora, 1900.—Observations were made over a gray marble slab 2 feet long, 2 by 8 inches on top, and lettered U. S. The center of the central hole marks the point. This slab is sunk with its top even with the surface of the ground. It is located in the town cemetery, 2 feet and 20 feet, respectively, from the northeast and southeast corners of lot No. 23, belonging to Mr. H. Bird. The mark or range used was the center of the ball at the foot of the flag pole on the high school. The mark or range bears 80° 55′.0 west of true north. The Congregational church spire bears 85° 38′.7 west of true north.

Harrison County, Logan, 1900.—Observations were made over a white limestone post 2 feet long, 4 by 5 inches on top, and lettered U. S. The center of the central hole marks the point. This post is sunk with its top 1 inch below the surface of the ground. It is located in the town cemetery, in the middle of the drive between Hughes' lot, No. 11, block G, and Rich's lot, No. 10, block G. This post is distant 14.8 feet east and 10.9 feet south from the northeast corner of T. L. Rich's monument. It is distant 6.6 feet west and 47.9 feet south from the southwest corner of the Bolter lot, No. 11. The mark or range used was the tip of the tower on C. A. Botler's house. The mark or range bears 52° 53′.4 west of true south. The southwest corner of brick house on Wm. Brayton's old property bears 2° 30′.7 east of true north.

Ida County, Ida Grove, 1900.—Observations were made over a white limestone post 3 feet long, 6 by 8 inches on top, and lettered U. S. C. & G. S. The center of the central hole marks the point. This post is sunk with its top 1 inch below the surface of the ground. It is located in Ida Grove Cemetery at the middle of the intersection of the two walks bounded by lots numbered 11, 12, 29, and 30. The mark or range used was the tip of the court-house tower. The mark or range bears 39° 46′.1 west of true south. The Presbyterian church spire bears 47° 14′.7 west of true south.

Iowa County, Marengo, 1900.—Observations were made over a limestone post 3 feet long, 6 inches square, and lettered U. S. C. S. The center of the cross marks the point. This post is sunk with its top flush with the surface of the ground. It is located in the northeast corner of the grounds of the Marengo High School, about 150 feet from the northwest corner of the school building, and about 60 feet from the northern fence of the yard. The marks or ranges used were the eastern lightning rod on Mr. S. Wilson's house and the tip of the iron post at the northeast corner of the school yard. Lightning rod bears 8° 48′.5 west of true north. The northeast post bears 71° 36′.0 east of true north.

IOWA—Continued.

Jasper County, Newton, 1900.—Observations were made over a marble post 2½ feet long, 7 inches square, and lettered U. S. C. S. The center of the cross marks the point. This post is sunk with its top flush with the ground. It is located in the grounds of the State Normal College, 216 feet northeast of the building and 151 feet from the corner of the president's house. The marks or ranges used were the crystal sphere on the middle lightning rod of the house belonging to Mr. Charles Kapple (almost due south from the station), and the middle of the base of the flag pole on the college building. Mark or range bears 10° 22′.2 west of true south. Flag pole on college building bears 16° 37′.3 west of true south.

Jefferson County, Fairfield, 1900.—Observations were made over the top of a stake driven in the ground and projecting 1 inch out of the ground. The center of a copper tack in this stake marks the exact point. It is located in a field at the corner of Burlington and Ninth streets, 91.6 feet in the rear of a stable, 121.4 feet from the fence which runs parallel to Ninth street, and 130.7 feet from the corner of the fences around the lot at the corner of the two streets. The mark or range was the center of the spire of the Presbyterian church east of south of the station. The mark or range bears 78° 19′.8 east of true south.

Jones County, Anamosa, 1900.—Observations were made over a limestone post 2½ feet long, 5 by 6 inches on top, and lettered U. S. C. S. The center of the cross marks the point. This post is sunk 2 feet in the ground. It is located in the Anamosa Cemetery at the bend of the road on the top of the hill in the northwest corner of the cemetery. The mark or range used was the spire of the Baptist church. Mark or range bears 58° 37′.8 east of true north. Tip of penitentiary water tank bears 35° 32′.9 east of true north.

Lee County, Keokuk, 1900.—Observations were made over a copper tack in a wooden stub driven flush with the ground. Observations were made over this point in July and October, 1900, and also in 1877 and 1888. This stub is located in the grounds of Mr. H. H. Clark, distant 72.8 feet from the north corner of Mr. Clark's house, and 69 feet from the west corner of this house. It is also distant 67.5 feet and 33.8 feet, respectively, from the north and west corners of Mr. Clark's yard. Mr. Clark's residence is at the corner of Second and Bloundeau streets. The mark or range used was the corner of a projecting cornice about 75 yards away, the only mark visible. This mark or range bears 14° 46′.2 west of true south.

Mahaska County, Oskaloosa, 1900.—Observations were made in two localities in this town Observations were first made over a copper tack in a stub which projects 2 inches from the ground. This stub is located in a field on the west side of South Second avenue immediately to the south of the house owned and occupied by Mr. Kuntz. It is distant 136 feet from the center of South Second avenue and 115.8 feet from the southwest corner of Mr. Kuntz's house. The mark or range used was the corner of gable roof belonging to Mr. Cowan, about three-fourths mile distant. The mark or range bears 34° 24′.4 east of true south. The corner of the gable of another house bears 70° 41′.7 east of true south.

Observations were made at a second locality in Oskaloosa. This second point is marked with a limestone post 2 feet long, and lettered U. S. C. S. The center of the cross marks the point. The top of this post is flush with the ground. It is located in the campus of Penn College, 75 yards south by west from the corner of the college building. The mark or range used was the tip of the weather vane on the water tank of the Iowa Central Railroad. Mark or range bears 58° 24′.6 west of true south. The foot of flag pole on college building bears 28° 02′.7 east of true north.

Monona County, Onawa, 1900.—Observations were made over a limestone post 3 feet long, 6 by 6 inches square, and lettered U. S. C. & G. S. The center of the central hole marks the point. This post is sunk with its top 1 inch below the surface of the ground. It is located in the town cemetery, on the south side of the road running east and west near the north fence of the cemetery, and about 200 feet from the entrance to the cemetery. The point is on a line with the middle of the walk between the Belknap and Oliver lots, and is 22.1 feet north of L. H. Belknap's monument. The mark or range used was the tip of the court-house tower. The mark or range bears 15° 14′.9 west of true north. The tip of railroad water tank northwest of station bears 65° 55′.3 west of true north.

Montgomery County, Red Oak, 1900.—Observations were made over a white limestone post 3 feet long, 6 by 8 inches on top, and lettered U. S. C. & G. S. The center of the central hole marks the point. This post is sunk with its top even with the surface of the ground. It is located in the new

IOWA—Continued.

City Cemetery, in the eastern part of the ornamental circle in the center of the cemetery, 59.6 feet and 64.1 feet, respectively, from the northeast and northwest corners of the Moates lot. The mark or range used was the tip of the court-house tower. The mark or range bears 30° 13′.8 west of true south. The tip of a tower on the North Ward school building bears 39° 38′.2 west of true south.

O'Brien County, Hartley, 1900.—Observations were made over a white limestone post 3 feet long, 6 by 6 inches square, and lettered U. S. C. S. The center of the central hole marks the point. This post is sunk with its top even with the surface of the ground. It is located in the town cemetery, in the walk immediately north of the Bouton lot, No. 7, section D, 3.9 feet and 20.3 feet, respectively, from the northeast and northwest corners of this lot. The mark or range used was the tip of the town water tank. The mark or range bears 16° 01′.3 west of true north. The Methodist church spire bears 6° 58′.1 east of true north.

Osceola County, Sibley, 1891.—The station is just southeast of the Sibley Hotel, 121.4 feet south of the fence along the main street of the town and 14.2 feet west of the fence along the road leading to the prairie. It is marked by a drill hole in the top of a dressed marble post 4 inches square sunk flush with the surface of the ground. The point of the cupola on the rear of the Sibley Hotel bears 64° 47′.5 west of true north.

Palo Alto County, Emmetsburg, 1900.—Observations were made over a white limestone post 3 feet long, 6 by 8 inches on top, and lettered U. S. C. S. The center of the central hole marks the point. This post is sunk with its top level with the ground. It is located in the town cemetery, immediately north of the Hoffman lot and 7.6 feet and 15.4 feet, respectively, from the northwest and northeast corners of this lot, and 30.5 feet from Peter Brown's monument. The mark or range used was the Catholic church spire. The mark or range bears 0° 30′.8 west of true north. The tip of the Adaline C. Harrison monument, near cemetery gate, bears 64° 44′.8 east of true south.

Plymouth County, Lemars, 1900.—Observations were made over a blue marble post 3 feet long, 6 by 6 inches square, and lettered U. S. C. S. The center of the central hole marks the point. This post is sunk with its top 1 inch below the surface of the ground. It is located on the campus of the Western Union College, east by north of the college building, and 175.6 feet and 201.0 feet, respectively, from the northeast and southeast corners of the foundations of this building. The mark or range was the spire of the Presbyterian church. Mark or range bears 10° 32′.3 west of true north. The German Methodist church spire bears 15° 54′.7 west of true north.

Pocahontas County, Fonda, 1900.—Observations were made over a blue marble post 2 feet 8 inches long, 6 by 6 inches square, and lettered U. S. C. S. The center of the central hole marks the point. This post is sunk with its top even with the surface of the ground. It is located in the town cemetery, in the walk, near the Reentsma lot No. 26, range 2, block 4, 3.2 feet and 17.8 feet, respectively, from the southwest and southeast corners of this lot. The mark or range used was the Methodist church spire. The mark or range bears 75° 52′.5 west of true north. The Presbyterian church spire bears 68° 39′.4 west of true north.

Polk County, Des Moines, 1888.—The station is just across Ninth street, in the northeast corner of the capitol grounds, 70 feet 8½ inches from the outer edge of the curbstone on Grand avenue and 89 feet 8 inches from the outer edge of the curbstone on east Ninth street. It is marked by a tack in the center of a wooden stub sunk flush with the surface of the ground.

Pottawattamie County, Council Bluffs, 1900.—Observations were made over a white limestone post 3 feet long, 6 by 6 inches square, and lettered U. S. C. & G. S. The center of the central hole marks the point. This post is sunk with its top even with the surface of the ground. It is located in the grounds of the Iowa State Institute for the Deaf. It is north of the main building, on the athletic grounds, between the apple orchard and the maple grove. This post is 107.0 feet south of the center of the adjacent road and 135.0 feet, 113.8 feet, and 111.0 feet, respectively, from the first, third, and fifth of the first row of trees in the adjacent maple grove. The mark or range used was the northwest corner of the boys' workshop. The mark or range bears 54° 23′.5 east of true south. The base of flagstaff on main building bears 23° 25′.1 east of true south.

Scott County, Davenport, 1888.—The station is in a lot on the north side of Seventh street, just west of where Scott street runs into it. It is due north of Mr. Herman Block's house, and is 14.0 yards from the fence along Seventh street and 29.5 yards from the fence along the east side of this lot. It is marked by a tack in the end of a post sunk flush with the surface of the ground.

IOWA—Continued.

Sioux County, Perkins, 1900.—Observations were made over a block of red sandstone 2 feet long, 7 by 12 inches on top, and lettered U. S. The center of the central hole marks the point. This sandstone block is sunk 2 inches below the surface of the ground. It is located in the grounds of the public school, 96.7 feet and 109.3 feet, respectively, from southeast and southwest corners of this school building, and 118.6 feet from the center of the road which runs near this school building. The mark or range used was the tip of the tower of the Congregational church. The mark or range bears 45° 20′.8 east of true north. The flag pole on Dykstra's store bears 55° 23′.8 east of true north.

Union County, Creston, 1900.—Observations were made over a white limestone post 3½ feet long, 6 by 8 inches on top, and lettered U. S. C. & G. S. This post is sunk with its top 1 inch below the surface of the ground. It is located in the park in the center of Graceland Cemetery, south of lot No. 572, section A, and 32 feet and 30.5 feet, respectively, from the southwest and southeast corners of this lot. The mark or range used was the Catholic church spire. This mark or range bears 23° 30′.8 west of true north. The German Lutheran church bears 21° 30′.0 west of true north.

Wapello County, Ottumwa, 1888.—The station is in the grounds of the Adams High School, 119 feet 2 inches from the southeast corner of the foundation of the school building and 63.0 feet from the eastern fence. It is marked by a tack in a cedar post.

Washington County, Washington, 1900.—Observations were made over a copper tack in a stub which projects 1 inch above the ground. It is located in a field a little to the north of the eastern end of East Madison street. This field borders on the eastern corporation limit, and lies in front of a house belonging to D. P. Johnson and occupied by S. S. Paul. Winfield Somouse owns this property. The stub is distant 151 feet from the corporation town limit, 80 from the center of the road which runs between the house and this field. It is also distant 128.6 feet and 56 feet, respectively, from the boundaries of this property. The mark or range used was the spire of the First Baptist church. This mark or range bears 86° 59′ west of true south.

Wayne County, Corydon, 1900.—Observations were made over a limestone post 3 feet long, 6 by 6 inches square, and lettered U. S. C. & G. S. The center of the central hole marks the point. This post is sunk with its top 6 inches above the ground. It is located in the northwest corner of the town cemetery west of W. H. Abel's lot, and 10 feet northwest of this monument. The mark or range used was the Baptist church spire. This mark or range bears 25° 20′.2 east of true north. The tip of the court-house spire bears 40° 28′.2 east of true north.

Webster County, Fort Dodge, 1900.—Observations were made over a white limestone post 3 feet long, 6 by 6 inches on top, and lettered U. S. C. S. The center of the central hole marks the point. This post is sunk with its top projecting 1 inch above the ground. It is located in the open space in the rear of the Corpus Christi Catholic Church, near the corner of Seventh street and Fourth avenue, formerly called Sixth and Jeannette streets. This post is 35 feet from Seventh street, 156 feet from Fourth avenue, and 116 feet from the northwest corner of this church. This point is supposed to be identical with the point over which observations were made in 1891. The mark or range used was the flag pole on Tobin College tower. The mark or range bears 3° 33′.9 east of true south. The center of the cross on Corpus Christi Church bears 65° 58′.3 east of true south.

Winneshiek County, Decorah, 1900.—Observations were made over a gray limestone post 3 feet long, 6 by 6 inches on top, and lettered U. S. C. S. The center of the central cross marks the point. This post is sunk with its top projecting 6 inches above the ground. It is located in the campus of the Luther College, 123 feet south of the road running east from the college building and 81 feet east of the road leading to the gate on the south side of the campus. The mark or range used was the north corner of the brickyard chimney. The mark or range bears 20° 08′.5 east of true south. The tip of the college tower bears 75° 49′.4 west of true north.

Woodbury County, Sioux City, 1891.—The station is in the grounds of the Morning Side University, in the eastern suburbs of the city. It is in the center of the large open space just in front of the center of the new school of art. It is 162 feet from the small projection in the front of this building and 111.5 feet from the fence along the front of the grounds. It is marked by a small drill hole in a dressed marble post, 4 inches square on top, sunk flush with the surface of the ground. The range or mark used was the spire on the Methodist church and bears 27° 32′.4 west of true south.

IOWA—Continued.

Worth County, Northwood, 1900.—Observations were made over a gray marble post 2 feet long, 2 by 5 inches on top, and lettered U. S. The center of the central hole marks the point. This post is sunk with its top even with the ground. It is located in the City Cemetery, on the north side of the road leading from the entrance. It is immediately south of the Christensen lot, No. 231, section 4, and is distant 6 feet and 22.8 feet, respectively, from the southwest and southeast corners of this lot, and 19.8 feet distant from the center of the road. The mark or range used was the tip of the tower of the water tank. The mark or range bears 65° 32′.7 east of true south. The spire of the Norwegian church (2 miles distant) bears 69° 13′.9 west of true north.

KANSAS.

Anderson County, Garnett, 1900.—The station is located on a slight rise in a large open field, known as Chapman Addition, to the south of town, being on the opposite side of the Western Pacific track and north of the Sante Fe track. The station was marked by a wooden peg.

Barton County, Fairmount, 1892.—The station is in the NE. ¼ sec. 8, T. 16, R. 5 W. of the sixth principal meridian, near the northeast corner of Fairmount schoolhouse lot. It is 29 feet from the north boundary and 29 feet from the east boundary of this lot and is 127 feet 8 inches from the northeast corner of the schoolhouse. It is marked by a marble post 6 inches square, lettered on top U. S. C. S., with two intersecting grooves.

Brown County, Hiawatha, 1900.—The station is on the campus of the academy, southeast of Hoover Hall about 80 feet. It is marked by a block of native stone 6 inches square, and lettered on top U. S. C. & G. S. The mark or range used was the northeast corner of the post-office building and bears 71° 37′.2 west of true north.

Coffey County, Burlington, 1900.—The station is in the southwest portion of a lot at the north end of Third street, owned by Mr. J. B. Young. It is 150 feet from the center of the street to the south and 250 feet from the center of Fourth street to the west. It is marked by a hedgewood peg.

Douglas County, Baldwin, 1901.—The station is the post on which magnetometer is mounted, at the temporary magnetic observatory. It is on the farm of J. C. Brockway, about three-fourths of a mile east of the town. The mark or range used is the ball on the flag pole of Science Hall, Baker University, and bears 48° 20′.6 west of true north.

Ellis County, Blue Hill, 1892.—The station is situated on a prominent ridge forming a part of the Blue Hills. It is in the S. ½ sec. 21, T. 12, R. 16 W. of the sixth principal meridian. It is marked by a marble post lettered on top U. S. C. S., with two intersecting grooves.

Ellis County, Hays, 1892.—The station is near the N. center sec. 24, T. 13, R. 18 W. of the sixth principal meridian, 29 feet south of the center of the road separating sections 24 and 13. It is about 4 miles northeast of Hays City. It is marked by a marble post 6 inches square, lettered on top U. S. C. S., with two intersecting grooves..

Ellis County, Smoky Hill, 1893.—The station is in the south central portion of sec. 21, T. 15, R. 20 W. of the sixth principal meridian, on a prominent hill overlooking the Smoky Hill River. It is in the southern part of a large cattle range operated by Frank Meserve, esq., and is 1 000 feet north of the southern fence of the range. It is marked by a marble post 6 inches square, lettered on top U. S. C. S., with two intersecting grooves.

Ford County, Dodge City, 1888.—The station is between Military avenue and Chestnut street, in the rear of Mr. B. Foreman's house, near the south end of avenue A. It is 91 feet from the northeast corner and 91.6 feet from the northwest corner of the fence around Mr. Foreman's yard. It is marked by a solid oak post.

Franklin County, Ottawa, 1900.—The station is in the center of the tract inclosed by the race track in Forest Park, just west of the Santa Fe Railroad depot. It is 370 feet from the northwest corner of the tabernacle and 410 feet from the northeast corner of the grand stand. It is also 47 feet from an elm tree, 3 feet in diameter, to the northwest. It is marked by a wooden peg. The location of the station is known to Tom Ashby, the keeper of the park. The mark used was the lightning-rod on the cupola of a stone house in North Ottawa, owned by Mr. Durmont, and bears 33° 47′.8 east of true north.

KANSAS—Continued.

Geary County, Junction City, 1888.—The station is north of Ninth street and west of Washington street, 38 feet 1 inch south of Mr. J. J. Tallman's barn and 38 feet 5 inches east of the fence around Mr. Tallman's yard. It is also 80 feet north of the inner edge of the plank walk along Ninth street. It is marked by a copper tack in a post sunk flush with the surface of the ground.

Jackson County, Holton, 1900.—The station is on the south side of the court-house grounds, near Fourth street. It is 169 feet 11 inches from the southwest corner of the court-house and 150 feet 7 inches from the southeast corner. It is marked by a limestone post lettered on top U. S. + C. S. The mark or range used was the most eastern edge of a brick chimney on Frank Knopff's house, on the corner of Fourth and Wisconsin streets, and bears 77° 16′.2 west of true south.

Johnson County, Olathe, 1901.—The station is near the northeast corner of the grounds of the State Deaf and Dumb Institute, 50 feet from the east fence and 79 feet from the north fence. It is marked by a stone about 7 inches square on top, projecting about 4 inches above ground and lettered U. S. C. & G. S. N. M. A similar stone, but lettered U. S. C. & G. S. S. M., was set 390 feet due south to mark the true meridian, the line being defined by a small drill hole in the top of each. From the north stone the central flag pole of the Institute building bears 51° 54′.6 west of true south.

Lyon County, Emporia, 1888.—The station is in the open lot west of the Bethel Welsh Congregational Church on Merchant street. It is 51 feet 4 inches from the southwest corner and 49 feet 3½ inches from the northwest corner of the foundation of this church. It is marked by a cedar post sunk flush with the surface of the ground.

Marshall County, Marysville, 1900.—The station is in the northwest corner of the court-house yard, 6 feet 2½ inches from the corner and 121 feet from the northwest corner of the court-house building. It is marked by a hard limestone post 7 inches square on top, lettered U. S. + C. S., and sunk even with the surface of the ground. The mark or range used was the center of the base of the flagstaff of the cupola on the Arand & Son building at the northeast corner of Broadway and Ninth streets and bears 84° 39′.3 west of true north.

Morton County, Richfield, 1900.—Observations were made over a stone post 3½ by 8 inches on top, and about 31 inches long, set 31 inches in the ground, with a cross on its top. The center of this cross marks the point. This post is located in the vacant space south of the "brick church" and southwest of Mr. Stoner's residence. It is approximately in line with the eastern wall of this church and is distant 309.9 feet from the southeast corner of the church. It is also distant 146.2 and 133.1 feet, respectively, from the southwest corner of the inclosure around Mr. Stoner's residence, and from the estimated center of the street just south of this vacant space. The mark or range was the corner post of a fence around a lot south of this stone post. This mark or range bears 1° 15′.8 west of true south. The spire of the church bears 6° 16′.8 west of true north. The lower part of the flagstaff on hotel bears 79° 19′.8 east of true south.

Ness County, Schmidt, 1893.—The station is on land of Mr. Schmidt, a prominent blacksmith of Wa Keeney, and is just north of his deserted stone house. It is in the NE. corner NW. ¼ sec. 2, T. 16, R. 25 W. of the sixth principal meridian. It is 125.2 feet from the one-half-mile stone, and 154.3 feet from the northeast corner of Schmidt's house. It is marked by a marble post 5 inches square, lettered on top U. S. C. S., with two intersecting grooves.

Ness County, Skaggs, 1893.—The station is in the SE. corner sec. 16, T. 16, R. 22 W. of the sixth principal meridian, on the farm of Mr. G. W. Skaggs, about 1¼ miles north and one-fourth mile west of the town of Brownell. It is in an offset of Mr. Skaggs's pasture, being 83.1 feet, 106.6 feet, and 105 feet, respectively, from the southeast, southwest, and northwest corner fence posts of said offset. It is marked by a marble post 6 inches square, lettered on top U. S. C. S., with two intersecting grooves.

Osage County, Lyndon, 1900.—The station is in the schoolhouse yard, west of the school building, on Ottawa avenue, just east of Fox street. It is 120 feet from the northwest corner and 100 feet from the southwest corner of the school building. It is marked by a hedge-wood peg.

Osborne County, Waldo, 1892.—The station is on the highest ground in the SE. ¼ sec. 24, T. 10, R. 14 W. of the sixth principal meridian. It is about 4½ miles northwest of Waldo, some 20 yards west of the road. It is marked by a dark-grained marble post 6 inches square, lettered on top U. S. C. S., with two intersecting grooves.

KANSAS—Continued.

Rush County, La Crosse, 1892.—The station is in the NW. ¼ sec. 12, T. 17, R. 18 W. of the sixth principal meridian on the highest point of a prominent hill, in a pasture belonging to Mr. George Schwab. It is about 5½ miles northeast of La Crosse. It is marked by a marble post 6 inches square, lettered on top U. S. C. S., with two intersecting grooves.

Russell County, Allen, 1892.—The station is in the NW. ¼ sec. 22, T. 14, R. 14 W. of the sixth principal meridian and about 1 mile west and 4 miles south of Russell. It is 446.8 feet southeast of the stone at the northwest corner of section 22 and 237 feet from the north line of this section and also 90 feet from the southeast corner of an old frame house. It is marked by a marble post 6 inches square, lettered on top U. S. C. S., with two intersecting grooves.

Russell County, Northwest Base, 1892.—The station is in the NE. ¼ sec. 25, T. 13, R. 14 W. of the sixth principal meridian, in a pasture belonging to Mr. Laing, of Russell. It is about 2 miles due east from the center of the town. It is 950 feet from the post at the railroad crossing to the west and 302 feet from the wire fence to the south in the line to Southeast Base. It is marked by a block of stone 6 inches square, with two intersecting grooves.

Russell County, Southeast Base, 1893.—The station is about midway between the towns of Russell and Bunker Hill, on the Union Pacific Railroad, and 350 yards south of the track at a point one-fourth mile east of a siding called Homer. It is in the northeastern part of sec. 8, T. 14, R. 13 W. of the sixth principal meridian. It is 140 feet south of the section line and 480 yards west of the northeast corner of the section. It is marked by a rough block of magnesia stone dressed to 6 inches square at top, with two deep intersecting grooves.

Sedgwick County, Wichita, 1888.—The station is on the campus in front of the central building of the Garfield University. It is 136 feet north of the center of the stone steps at the northeast corner of the main building and 165.5 feet east of the center of the plank walk leading from the main building to the students' quarters. It is marked by a dressed stone post 4 inches square at the top, with two intersecting grooves. The north rod on the cupola of the Garfield University bears 57° 45′.2 west of true south.

Seward County, Liberal, 1900.—Observations were made over a stone post 6 by 6 inches on top and lettered U. S. C. & G. S., with a hole in the center of it. The center of this hole marks the point.

It is located in the vacant block northeast of the court-house square. This lot is the property of the town company.

The stone post is distant 150.2, 178.5, and 195 feet, respectively, from the northwest corner of the fence around the yard of the house south of the station, and from the northeast corner of the court-house building, and from the northeast corner of the inclosure around the court-house square. The mark or range used was the tip of the center post on the railroad water tank. This mark or range bears 8° 39′.8 west of true south. The steeple of the Christian Church bears 86° 28′.1 west of true north. The steeple of the Presbyterian Church bears 73° 10′.2 west of true north.

Trego County, Big Creek, 1893.—The station is in the extreme SW. corner NE. ¼ NE. ¼ NW. ¼ NW. ¼ of sec. 17, T. 13, R. 23 W. of the sixth principal meridian. It is 104.8 feet from the northwest corner stone of the section and 296 feet south of the center of the well-used trail which runs along the section line. It is marked by a stone post 5 inches square, lettered on top U. S. C. S., with two intersecting grooves.

Trego County, Trego, 1898.—The station is in the northeast part of sec. 27, T. 13, R. 21 W. of the sixth principal meridian. It is about 500 yards from the northeast corner of the section and about 120 yards south of the wire fence along the northern boundary of the section. It is about 60 feet west of the well-traveled road to Ellis. It is marked by a dark-grained marble post, 6 inches square, lettered on top U. S. C. S., with two intersecting grooves.

Wallace County, Curlew, 1892.—The station is in the NE. corner SW. ¼ SW. ¼ NE. ¼ NE. ¼ sec. 17, T. 14 S., R. 40 W., 4 miles south and 1½ miles west of the Sharon Springs. It is near the northern edge of the plateau. It is marked by a white oak stub painted red.

Wallace County, McLane, 1892.—The station is located in the SE. ¼ SE. ¼ SW. ¼ SE. ¼ SE. ¼ sec. 3, T. 12 S., R. 42 W. It is about 14 miles northwest of Sharon Springs. It is some 200 meters north of the road leading from McLane's ranch to Sharon Springs. It is marked by a tack in the end of a white oak stub.

KENTUCKY.

Breathitt County, Jackson, 1900.—Observations were made over the north meridian stone located in the college institute grounds. A south meridian stone was also located in these grounds 206 feet true south of the north stone, 26 feet from the east corner of the school building, and 14 feet from the corner by the entrance to the building. These meridian stones are 2 feet long and 6 inches square on top, with a cross in the center of each stone marking the true meridian. The mark or range used was the east corner of the school building. This mark or range bears 0° 20′.2 east of true south.

Caldwell County, Princeton, 1901.—The station is on the campus of the Princeton College, at the corner of Fredonia road and Plumb street. A meridian line was established, the south end being the magnetic station. This line is 359.75 feet long and is marked by stone posts. The south stone is 103.9 feet from south fence and 76.35 feet from east fence. The mark or range used was the peak of the roof of Mr. Lamb's house and bears 0° 11′.5 west of true south.

Carter County, Grayson, 1900.—Observations were made over a poplar tent pin located in the court-house yard, just inside the gate in the east fence. It is distant 31.1 feet from this fence and 103.8 feet from the south fence of the court-house yard. The mark or range used was the east edge of a tree on edge of the opposite hill. This mark or range bears 19° 44′.3 east of true south.

Daviess County, Owensboro, 1901.—The station is about 2 miles from the court-house and on the south side of the Leitchfield road in a field of Mr. J. H. Nave's farm. It is in front of the house, 163.7 feet from the fence along the Leitchfield road and 99 4 feet from the fence on the south. The mark or range used was the most northern edge of the roof of the barn in the Jewish Cemetery and bears 44° 12′.8 west of true north.

Fayette County, Lexington, 1896.—The station is located in an orchard belonging to James Layton, 41 paces west of Limestone street turnpike road, and 144 paces south of the first tollgate on the turnpike road. It is a little west of south from the tollgate and about 1¼ miles north of Lexington court-honse. It is marked by a pine stub.

Hancock County, Hawesville, 1900.—Observations were made over a limestone post 3 feet long, 6 by 8 inches on top, and lettered U. S. C. & G. S. A small hole in the center of this post marks the point. It is located in the town cemetery, in a portion that has recently been added. This post is sunk with its top 1 inch below the surface of the ground, at the center of the crossing of two walks bounded by lots numbered 70, 71, 85, and 86. The mark or range was the northwest corner of the schoolhouse in the valley south of the station. This mark or range bears 35° 45′.5 east of true south.

Jefferson County, Louisville, 1896.—The station is in the northeast corner of Cherokee Park in the rear of Alexander house and 135 feet from the center of the east porch of the house. It is north of the house and is marked by an oak stub.

Logan County, Russellville, 1901.—The station is on the campus of Bethel College, about one-fourth mile west of the court-house grounds. A meridian line was established, the north stone of which is the magnetic station. This line is marked by stone posts, and is 381 feet long. The north stone is 64.0 feet west of the east fence. The south stone is about 10 feet north of the walk leading to college hall. The mark or range used was the dome of Colonel Caldwell's house, and bears 48° 14′.6 east of true north.

McCracker County, Paducah, 1901.—The station is about 2 miles from the town out the Mayfield road and in a large, open field belonging to Jake Biederman. It is not marked in any manner, but is about 150 feet from the fence on the south and 250 feet from the fence on the west.

Madison County, Richmond, 1900.—Observations were made over a Bedford limestone post 30 inches long, set 27 inches in the ground, 6 inches square on top, and lettered U. S. C. & G. S., with a groove running north and south. It is located in the grounds of the Central University, not far from the chancellor's house on Fourth avenue, distant 133 feet from Fourth avenue and 251 feet from the gate leading to the chancellor's house. A south meridian stone similar to the north meridian stone, except for the lettering, was located 374 feet from it, near the trees in front of the main building. The mark or range used was the east corner of the wooden building showing by the east corner of the main building. This mark or range bears 7° 46′.7 east of true south.

Montgomery County, Mount Sterling, 1900.—Observations were made over a poplar stub located on the property of Mr. Oliver, the county surveyor, about three-fourths of a mile west of the town on the Blue Lick turnpike. The station is near the northwest corner of the front lot, not far from an old

KENTUCKY—Continued.

well, and 17½ feet from the west fence. Another stub was driven 41 feet true north of this stub, 7.3 feet west of the outside of the well, and 10½ feet from the fence. Still another stub was driven 258½ feet due south of the magnetic station, 23½ feet from the street fence, and 60 feet from the west fence. Mr. Oliver intends replacing the pegs with stones to make the meridian line permanent. The mark or range used was the southwest corner of Mr. Oliver's house. This mark or range bears 25° 33′.0 east of true south.

Muhlenberg County, Greenville, 1901.—The station is about one-fourth mile northeast of the court-house, in the grounds of the Greenville Seminary. A meridian line was established, the south end being the magnetic station. This line is marked by stone posts, and is 285.5 feet long. The south stone is 72.5 feet east of the fence along Trowbridge street and 78.8 feet north of the fence along the main cross street. The mark or range used was the peak of the house of Mr. Rotherock, and bears 70° 09′.6 west of true south.

Rockcastle County, Livingston, 1900.—Observations were made over a point in the lot west of the Sand Brook Hotel, 18½ feet from a ditch, 48 feet northwest of a fence, and 24.7 and 24.4 feet, respectively, from two trees between it and the fence. Observations were also made in this lot in 1881. The mark or range used was the right-hand edge of the trunk of a dead tree on the top of the hill, to the southwest. This mark or range bears 44° 21′.4 west of true south.

Rowan County, Morehead, 1900.—Observations were made over a poplar tent peg located in the court-house yard 19 feet from the northeast fence of the yard, 74½ feet from the east corner and 81½ feet from the north corner of the court-house building. A north meridian stone was located about 5.3 feet east of this peg, 14.2 feet from the fence, 75 feet from the north corner and 69.2 feet from the east corner of the court-house building. A south meridian stone was located 188 feet from the north meridian stone, 8.1 feet from the southeast fence of the court-house square. The mark or range used was the gable end of a house just east of south. This mark or range bears 8° 06′.7 east of true south.

Union County, Morganfield, 1901.—The station is about 2 miles from the court-house on the farm of Mr. H. MacElroy, on the Henderson road. A meridian line was established, the south end of which is the magnetic station. This line is marked by stone posts and is about 1,463 feet long. The south stone is in a large open field about one-fourth mile from Mr. MacElroy's house. It is 110.5 feet from the fence on the east side of the road, near the old MacElroy house. The north stone is set about 6 feet from the fence on the west, about 10 feet from the south corner of the fence around the Payne schoolhouse. The mark or range used was the peak of the roof of Mr. M. Thomas's house, and bears 17° 46′.0 west of true south.

Whitley County, Williamsburg, 1900.—Observations were made over a pine stub on the southwest side of the court-house. Observations were made over the same stub in 1896. Two marks were placed on the fence to indicate the true meridian, one, a piece of wire wrapped around a short upright in the fifth panel east of the northwest gate, due north of this peg, the other one south of it, a cut in the bottom stringer, covered with a piece of wire, in the ninth panel from the south corner. The mark or range used is a chimney of a house on the hill some distance away. This mark or range bears 31° 43′.4 east of true south.

LOUISIANA.

Acadia Parish, Mermentau, 1890.—Station is in open space in front of the Mermentau Hotel, and north of the railroad station. Point is marked by a cypress post 2 feet long sunk flush with surface of ground. Post is distant 81.6 feet, 80.5 feet, and 45.2 feet, respectively, from the northwest corner of the railway stock pen, the west fence inclosing the hotel, and the southeast corner of the garden north of railroad station. Center of chimney of railroad station bears 44° 40′.7 west of true south. South rod on hotel bears 57° 19′.3 east of true south.

Ascension Parish, Donaldsonville, 1896.—Station is located in large open space near entrance of Catholic cemetery. It is marked by a pine post sunk flush with ground. This post is 65 feet from the eastern edge of Vincent street and 60 feet from the plank inclosure to the Catholic cemetery. The tall cross on tomb of Joseph Landry bears 26° 34′.7 west of true south. Spire on new Catholic church bears 17° 38′.2 east of true north. Spire on old convent bears 9° 30′.3 west of true north.

LOUISIANA—Continued.

Caddo Parish, Shreveport, 1888.—Station is in the east corner of court-house yard, near the corner of Marshall and Milan streets. Station is marked by copper tack in post 2 feet long. This post is distant 86 feet 8½ inches, 65 feet 4½ inches, and 94 feet 8 inches, respectively, from east corner of parish court-house, edge of outside of the curbstone on Marshall street, and edge of the outside of the curbstone on Milan street. The mark or range is the spire on cupola of distant house belonging to Mr. Johnson, and bears 16° 49′.6 west of true south. Spire on Y. M. C. A. bears 69° 04′.6 east of true north. Central rod on post-office building bears 18° 48′.4 west of true north.

Calcasieu Parish, Lake Charles, 1890.—Station is in open square adjoining the court-house, in rear of jail and between jail and lake. It is marked by a pine post 2 feet long sunk flush with surface of the ground. This post is distant 54.2 feet from the inner edge of North street, 38.9 feet from the inner edge of South street, and 120 feet from the inner edge of the shore line of Lake Charles. Spire on Baptist church bears 52° 22′.4 east of true south. South pinnacle of the roof of jail bears 73° 19′.4 east of true south. North pinnacle of the roof of jail bears 88° 28′.6 east of true north.

Caldwell Parish, Columbia, 1901.—The station is southwest of town on a range of hills that runs north and south. It is in the cemetery on the hill opposite the one on which the graves are located. It is marked by a stone post 6 inches square, set so as to leave 3 inches projecting above the surface of the ground. The exact location can be had from the authorities at the court-house. The mark or range used was the flagstaff on the public schoolhouse on Boatner street and bears 45° 11′.2 east of true north.

East Baton Rouge Parish, Baton Rouge, 1896.—Station is located in the grounds of the new Louisiana State University, in the open space just in the rear of the treasurer's office, near the horticultural garden. Station is marked by a pine post 2 feet long sunk flush with surface of ground. This post is 75 feet from the northeast corner of the treasurer's office and 30 feet from the hedge around the horticultural garden. The mark or range, spire of Catholic church, bears 0° 05′ west of true south. Center of student's society hall bears 11° 34′.0 west of true south, and the foot of a rod on treasurer's office bears 65° 08′.3 west of true south.

Lafayette Parish, Lafayette, 1890.—Station is in large open square at the intersection of Main street and Lincoln avenue, owned by Judge James Parkerson. Station is marked by a cypress post sunk 2 feet in the ground and flush with the surface. This post is distant 106 feet, 57 feet, and 64 feet, respectively, from edge of Main street, edge of Lincoln avenue, and corner of plank inclosure between Judge Parkerson's grounds and garden. Rod on Judge Parkerson's house bears 35° 29′.7 west of true south. Center of cupola on the Judge's stable 53° 28′.7 west of true south. The flag pole on depot hotel 71° 54′.7 east of true north.

Iberia Parish, Marsh Island light-house, 1886.—Observations were made at the triangulation station on the west end of Marsh Island at the entrance to Vermilion Bay, near where the light-house formerly stood. Station was marked with a drain tile filled with cement.

Orleans Parish, New Orleans, 1895.—Station is very near center of mile race track and 81 feet east of fence running north and south and dividing inclosed space into two fields. Station is due east of gateway in this fence and bridge across draining ditch on slightly elevated roadway. The mark—west door of large brick building south of track, line joining double doors—bears 3° 45′.2 west of true south. In 1901 observations were made at Audubon place.

Orleans Parish, East Base, Lake Pontchartrain, 1896.—East Base magnetic station is located on the prolongation of the line from West Base to East Base triangulation stations about 15 meters east of East Base. The mark or range used was West Base. Azimuth from East Base to West Base is 86° 37′.2 west of true south. East Base at "West End," New Orleans, is the center of cross marked on head of copper nail in cypress stump about 3 feet high. This stump is on the east bank of the upper drainage canal due east from the schoolhouse upon the road on the opposite bank. Stump is 54.8 feet east from tree on east bank of canal and 52.6 feet from southwest corner of picnic house of William Smith. Station is also about 230 meters above mouth of canal.

Rapides Parish, Alexandria, 1901.—The station is in the national cemetery at Pineville, on the west side of the Red River. It is marked by a marble post 6 inches square, set so as to leave 3 inches projecting above the ground. This post is 135 feet from the brick fence on the southeast side of the

LOUISIANA—Continued.

cemetery and 223.8 feet from the brick fence on the northeast side. The mark or range used was the top of a well house on the southern part of the grounds, and bears 46° 27′.0 west of true south.

Rapides Parish, Cheneyville, 1896.—Station is located in large open lot adjoining the Catholic church and about 500 yards northeast of railroad station. It is marked by a pine post sunk 2 feet in ground and flush with surface. This post is distant 160 feet from the northwest corner of the Catholic church. The cross on the Catholic church bears 36° 43′.1 east of true south. Spire on Colored Methodist Church bears 16° 02′.4 west of true north.

St. John the Baptist Parish, Northwest Point, 1896.—Magnetic station No. 1 is located on the shore of the lake about 150 meters south-southwest of Northwest Point triangulation station. Mark or range used was Northwest Point, and bears 67° 37′ east of true north. Station No. 2 is located on shore of lake about 400 meters northeast of Northwest Point triangulation station. Triangulation station bears from magnetic station 42° 52′.8 west of true south. Northwest Point station is the center of a square hole, cut for the signal pole, in the cap block upon the side of the top of a cypress tree, sawed off about 40 feet above the ground on the northwest shore of Lake Pontchartrain. Three trees were blazed and serve as reference marks, with 3 copper nails in each blaze. From base of cypress to north-northwest tree (dead cypress), 14.95 meters; to west tree (live oak), 15.08 meters; to north-northeast tree (cypress), 21.22 meters.

St. John the Baptist Parish, Kirsch, 1896.—Magnetic station is located about 30 meters south of triangulation station, which is about 20 meters from the lake shore on the property of Mr. Kirsch, near the Illinois Central Railroad. Triangulation station is marked by a drain tile 2½ feet long filled with cement and projecting 10 inches above the ground. It is distant 39.31 meters and 50.01 meters, respectively, from the north and south corners of dwelling house.

St. John the Baptist Parish, Frenier, 1896.—Station is located on the prolongation of the line from "magnetic cypress" to Frenier triangulation station, at a distance of about 10 meters to the south of this last station. Frenier triangulation station is on shore of lake opposite the post-office and railroad station. Station is marked by head of copper nail sunk in the cement filling of a drain pipe which projects above the ground about 1 foot.

St. Mary Parish, Morgan City, 1896.—Station is in the center of a grass plot in front of a wooden house occupied by a Mr. Frank Williams, on the north bank of the Bayou Tigre, just east of Morgan City. It is 35 feet north of edge of Bayou Tigre. The mark—the rod in the center of Mr. Bateman's house on south side of Bayou Tigre—bears 45° 11′.1 west of true south. Spire of Catholic Church bears 46° 49′.9 west of true north. Station is 98½ feet east of one red haw tree and 21 feet southwest of another.

Tangipahoa Parish, Amite, 1896.—Station is located in eastern part of court-house grounds, just in the rear of the Episcopal church. It is marked by a pine post sunk 2 feet in the ground and flush with surface. This post is 70 feet from the plank fence around the Episcopal church and 185 feet from the northeast corner of the court-house. The flag pole on the court-house bears 62° 05′.9 west of true south. The rod on the court-house 67° 52′.1 west of true south. Cross on Episcopal church 2° 28′.9 west of true south.

MAINE.

Aroostook County, Houlton, 1887.—The station is located in the parade grounds of old Hancock Barracks, about 1 mile east of town. The exact point is over the center of the central granite pier of the three piers which mark the county meridian. The point of the southern pier was used as the mark or range and found to bear 0° 03′ east of true south.

Aroostook County, Presque Isle, 1887.—The station is in the large open park in front of the Phair Hotel, on Main street. It is 74 feet from the body of the third elm tree from Main street on north side of park and 83.5 feet from the third elm tree on south side of park.

Cumberland County, Portland, 1895.—Station is located in the grounds of Mrs. J. B. Brown, on Bramhall hill. It is 164 feet from the brick wall along the north side of Mrs. Brown's property and 45.5 feet from the picket fence along the west side of her property. The center of the surveyor's central stone is distant 362.5 feet and bears 28° 05′.7 west of true north. The center of the cupola of the Maine General Hospital bears 23° 44′.3 east of true north.

MAINE—Continued.

Franklin County, Farmington, 1887.—The station is located in the flats of Sand River south of the town and in the rear of Prescott's factory. It is on land owned by Byron Farrar. It is distant 56.5 yards from the south corner of Prescott's factory and 55 yards from the fence at the end of Cross street. The mark or range used was the court-house spire, which bears 9° 26′ west of true north. The center of the State normal school cupola bears 26° 05′ east of true north.

Lincoln County, Damariscotta, 1887.—Station is in the open triangular lot in front of the Methodist church, at the intersection of Main and Church streets. The station is equidistant from the corners of the brick foundation of this church, being 27 meters from each. The mark or range used was the spire of the Baptist church, and bears 52° 11′.8 west of true south.

Penobscot County, Bangor, 1895.—Station is on Thomas hill and is marked by a marble post 6 by 2 by 18 inches, sunk flush with surface of ground. This post is 93 feet from the fence around Governor Davis's yard, which marks the southern boundary of Highland street. It is also distant 95 feet from the fence of the Prentis property, which is in line with the northern boundary of Thomas street (now known as Highland avenue), when extended across Highland street. The central rod on Carrier's tannery bears 51° 42′ east of true south. The East Bangor Meetinghouse spire bears 20° 15′ east of true south.

Penobscot County, Mattawamkeag, 1887.—The station is due south of the residence of G. W. Smith, in the large open lot between Mr. Smith's house and Mr. Joseph Laing's house. Exact point is marked by a solid locust post driven flush with surface of ground. This post is 42 feet from the fence next to Mr. Smith's barn, and 167.5 feet from the fence along the road.

Piscataquis County, Greenville, 1887.—The station is in the large open lot north of the Lake House and due east of the South Cove of Moosehead Lake. It is distant 178.5 feet from the north side of the Lake House barn and 94 feet west of the fence along the road to the east of Lake House.

Somerset County, Pittsfield, 1887.—The station is located on the grounds of the Central Maine Institute, opposite the entrance to Pleasant street. It is 62 yards from the northwest corner of the main building and 35.5 yards distant from the corner of Mr. John Millet's picket fence.

Washington County, Calais, 1895.—Station is 421 meters due south of the transit pier, in a pasture belonging to Mr. Murchie. It is 61½ meters to the fence to the northwest and 85 meters to the fence to the southwest. The transit pier is on the top of the ledge back of the high school.

Washington County, Danforth, 1887.—Danforth is the nearest railroad station to the town of Bancroft, and is about 3 miles distant. The magnetic station is in the north edge of the village on the summit of the hill just in front of the district school, No. 5, distant 35 yards from the south fence and 57 yards from the east fence. Exchange Hotel is east of south of magnetic station.

Washington County, Eastport, 1895.—Magnetic hut on parade grounds of Fort Sullivan.

Washington County, Machiasport, 1887.—Station is on United States property just in rear of Fort O'Brien. It is 135 feet a little north of west from the center of the old earthen magazine.

Washington County, Mill Bridge, 1887.—Station is on the summit of the hill due north of the Christian Church on Bridge street. It is 158 feet from the north corner of the brick foundation of this church and 190.5 feet from the east corner.

Washington County, Vanceboro, 1887.—The station is in the open lot adjoining the Catholic church. It is distant 79 feet and 98 feet, respectively, from the northwest and northeast corners of this church. Catholic church is about due south of Maine Central Railroad station and hotel.

York County, Kittery Point, 1898.—Station is located on the lawn in front of the old "Sparhawk House." It is 75 feet almost due south from the door of this house, and distant 42 feet, 48 feet, and 30 feet, respectively, from three trees, the first to the east of north, second west of north, and third south of west.

MARYLAND.

Allegany County, Cumberland, 1897.—In the large open area on Camp Hill, north of Rose Hill Cemetery and south of Willis Creek. To find station, go 75 paces along the north iron fence of cemetery, starting from northeast corner, then 75 paces at right angles toward Willis Creek. According to town map this area is subdivided into lots and streets, but no sign of the latter on the ground at present. Station may have been between Sedgewick and Niagara streets. According to the map it is about 4 667 feet due west of middle point of Decatur street, on which Mosman's astronomical and

MARYLAND—Continued.

magnetic stations of 1864 were located. Station is also about 2 744 feet west of court-house and about 1 280 feet north, and may possibly be over a cement mine. Site was selected in the absence of the county surveyor by Thomas L. Patterson.

Allegany County, Lonaconing, 1898.—In the south part of baseball field south of Maryland Coal Company's office. The precise point is marked by a locust stake, and can be indicated by Mr. F. E. Brackett, superintendent of the coal company.

Allegany County, Westernport, 1897.—The station is on north side of hill along road leading down the river from West Virginia Railroad station and about 100 yards east of last house.

Anne Arundel County, Annapolis, 1897.—On the Naval Academy grounds, in the open area near the observatory, 45 paces west-northwest of observatory and 62 paces northeast of Herndon monument. Site was chosen by Professor Terry, in charge of the physical department of the academy.

Anne Arundel County, Annapolis, 1900.—Observations were made over both ends of the meridian line located on the Naval Academy grounds, in the large open space south of the naval cemetery. The north stone is 93 feet from cemetery road, 190 feet from Severn county road, and about 300 feet from the south stone.

Anne Arundel County, Fairhaven, 1897.—On the hill not far from the steamboat landing.

Anne Arundel County, Webb, 1899.—Near the 1897 scaffold of the triangulation station, about 94½ feet southeast from granite post marking the station. This is near the site of Boutelle's magnetic station of 1868.

Baltimore County, Bradshaw, 1897.—On the grounds of Colonel Taylor, east of the Baltimore and Ohio station, 25 paces south-southeast of locust tree.

Baltimore County, Cockeysville, 1896.—On Mr. Cockey's property, a large open lot on right of road, near stone bridge. The station is about 500 feet west of road and 25 feet east of a clump of three willow trees.

Baltimore County, Hydes, 1897.—On Mr. Hyde's tract, back of garden behind the store and railroad office, about 125 paces west of railroad track.

Baltimore County, Parkton, 1899.—On top of the hill west of the railroad station and over the first boundary stone marking the property of the railroad company. This boundary stone is on the hill, about 20 yards north of wooden fence leading up the hill.

Baltimore County, Reistertown, 1899.—In the large open field west of the Franklin School.

Baltimore County, Towson, 1897.—In the ample grounds on the west side of the court-house. A meridian line was established at the time and marked by substantial granite posts. The observations were made over these posts.

Baltimore City County, Baltimore, 1895.—The station is in the extreme eastern part of Fort McHenry, between a locust tree and the sea wall. It is marked by a locust post 13 yards from the tree and 16.5 yards from the sea wall. Lazaretto Point light-house bears 80° 30′ east of true north. Fort Carroll light-house bears 44° 20′ east of true south.

Calvert County, Prince Fredericktown, 1896.—In the grounds of the court-house, between its southwest corner and small frame building occupied at the time by a shoemaker; 15 paces north of latter building and 25 paces due east of wooden structure used as a jail. The roadbed of proposed Drum Point Railroad is about 200 feet to the west.

Calvert County, Prince Fredericktown, 1900.—Observations were made over both ends of the meridian line located in the court-house square. The south stone is 13.8 feet from the south fence, 33.3 feet from the east fence, and about 200 feet from the north stone.

Caroline County, Denton, 1900.—Observations were made over both ends of the meridian line, which is located in the court-house yard. The north stone is 55 feet east of the fence of the jail yard. The south stone is 260 feet from the north stone and 2 feet north of the edge of the walk along the south side of the square.

Caroline County, Ridgely, 1896.—On the grounds in the rear of frame schoolhouse, corner of First street and First avenue west; 53 feet west of southwest corner of rear extension of schoolhouse and 31½ feet east of young maple tree.

Carroll County, Manchester, 1899.—In the lot back of the schoolhouse and Methodist church, 37 feet east of large cherry tree and 104.3 feet from northwest corner of schoolhouse. Marked by a tent peg.

MARYLAND—Continued.

Carroll County, Sykesville, 1899.—The station is in the large open field, about 300 feet back of the new brick school.

Carroll County, Taneytown, 1899.—In the yard back of Prof. Henry Meier's Academy, 307 feet from west fence, 19.2 feet from east fence, and 62.8 feet from north corner of small frame house. Professor Meier proposes to mark the station permanently.

Carroll County, Westminster, 1896.—In the grounds back of court-house, about 22 paces west of back entrance, near edge of pavement. Site not a good one.

Carroll County, Westminster, 1900.—Observations were made over both ends of the meridian line located in the grounds of the Western Maryland College, about 1 mile north of the court-house. The south stone is in the athletic grounds, 60 feet from a garden fence and 65 feet from a small wooden stable. The north stone is near the northern boundary of the college property. From the south stone the spire of the German Reformed church bears 12° 35′ west of true north.

Cecil County, Calvert, 1899.—Station is near southeast corner of school lot, about in line with east edge of school and 16 paces north of large oak.

Cecil County, Elkton, 1896.—The station was within a few feet of the south stone of the meridian line in the high-school grounds, established in 1900.

Cecil County, Elkton, 1900.—The station is the south stone of the meridian line in the high-school grounds. It is 36 feet from the west fence, 34.5 feet from the south fence, and about 270 feet from the north stone.

Cecil County, Rising Sun, 1899.—Station is in Mr. H. J. Briscoe's field, near the north corner of fence and east of railroad station. Precise point is marked by a tent peg.

Charles County, La Plata, 1897.—When establishing the meridian line in the west grounds of the court-house yard, observations were made at various points and no appreciable local attraction found. The adopted station is the south monument. The 1896 station is now covered by a wooden fence surrounding the grounds.

Dorchester County, Cambridge, 1897.—In the grounds on the south side of the court-house, over the southeast monument of the true northwest-southeast line established in 1897. This monument, owing to the nature of the soil and of the surroundings, had to be placed on the grounds adjacent to the court-house lot, owned by Mr. James Wallace. Water was struck about 3 feet below the surface. This monument is a granite post, seven inches square and 4½ feet long, projecting about 8 inches above the ground and having in its center a brass bolt with a cross cut in to mark the northwest-southeast line. The northwest monument is a similar pillar and is fully 350 feet away. There may be a slight local disturbance near the latter, owing to vicinity of court-house. The southeast monument is doubtless free of local attraction; near the jail, however, a decided disturbing influence makes itself felt.

Dorchester County, Hurlock, 1896.—Directly in front of frame schoolhouse, on the right-hand side of road to East Newmarket, near the road.

Dorchester County, Hooper Island, 1902.—Observations were made at Rip triangulation station, at the southern end of Hooper Island.

Frederick County, Frederick, 1896.—First station: In the southeast part of the grounds back of the State Deaf and Dumb Asylum. Marked by two stakes, one 1¼ by 1¼ by 8 inches, and another 4 feet west ½ by 2 by 8 inches; the former marks the station and was driven flush with the ground; the station is 26 paces north of the south hedge fence and 34 paces from southeast corner of hedge. Second station: North meridian stone in the grounds on the east side of the court-house. (The first station is the preferable one.)

Frederick County, Libertytown, 1899.—In the large lot back of schoolhouse, opposite Liberty Hotel. The precise point is marked by a solid stub 167.9 feet from north front of schoolhouse, 46.35 feet from northwest corner of small house, 33.35 feet from east fence, and 25.5 feet from line of locust trees on west side.

Garrett County, Accident, 1899.—In south corner of school lot, opposite Bellevue Hotel. Marked by a stake, which is 62.9 feet from east corner of frame schoolhouse and 93.7 feet from west corner.

Garrett County, Backbone Mountain, 1897.—On the summit of Backbone or Big Savage Mountain, near the Michler monument, a monument built of dressed stones and about 4 feet high. The precise

MARYLAND—Continued.

point was about 11 feet south of the monument, which is about 15 000 feet north of the Fairfax stone and about 3 323 feet above sea level.

Garrett County, Camp Fairfax, 1897.—Near the barn on Pat Flynn's farm, situated east of the Michler line and between the Fairfax and Backbone monuments.

Garrett County, Corunna, 1900.—On W. McCulloh Brown's estate, south of Oakland. Precise point was over the north monument of the meridian line established by L. A. Bauer in 1897.

Garrett County, Fairfax stone, 1897.—This stone was the initial point of the Michler survey of the western boundary line, and is situated at one of the head springs of the North Branch of the Potomac River. The original Fairfax stone, planted in 1745, has disappeared since the Michler survey (1859), and instead is a monument about 3 to 4 feet high, which Lieutenant Michler stated he placed directly behind the Fairfax stone, and used as a pier for his instrument. The magnetic observations are made some few feet north of the stone, but mainly, however, at a point 463 feet north.

Garrett County, Fike Hill East, 1897.—The magnetic station was 30 feet a little west of north from the Michler monument.

Garrett County, Fike Hill West, 1897.—North of a large flat rock at north end of clearing for the meridian line.

Garrett County, Grantsville, 1899.—Near the west corner of schoolhouse lot, opposite Farmer's Hotel, marked by a cherry stake 2 by 2 inches square, with brass screw in top, and having a pine stake driven alongside as a wedge. This stake is 69.25 feet from east corner of schoolhouse, and 32.8 feet from second locust tree east of gate of entrance to school.

Garrett County, Lower Hill, 1897.—A few feet north of stone projecting about a foot above the ground, with a copper bolt in it, which L. A. Bauer planted in 1897 to mark his meridian line. A few feet east is a pile of stones placed by Lieutenant Michler in 1859.

Garrett County, McHenry, 1899.—Over red sandstone rock in lot south of frame schoolhouse, directly north of Brison Welsh's house. The point is marked by a one-half inch hole drilled in the rock 57.7 feet from the southwest corner of schoolhouse and 66.8 feet from southeast corner.

Garrett County, New Germany, 1899.—On Mr. J. C. Otto's farm. In the meadow about 300 feet east of house and about 25 yards east of garden. Precise point is marked by a one-half inch hole drilled in a large flat sandstone sticking out of the ground. There is another stone about 10 feet west.

Garrett County, Oakland, 1899.—In the court-house yard over the south monument of the meridian line established by L. A. Bauer in 1897.

Garrett County, Snaggy Mountain, 1897.—The magnetic station is marked by a hole drilled in a rock 75.85 feet nearly north of Michler monument.

Garrett County, Swanton, 1899.—In the southeast corner of garden in front of W. H. Lohr's frame dwelling, used as a boarding house. Precise point is marked by a nail in a stake driven in an old stump about one-fourth foot above the ground.

Garrett County, Taylors Hill, 1897.—The magnetic station is 51.3 feet north-northwest of meridian station.

Harford County, Belair, 1897.—When establishing a meridian line observations were made at various points in vicinity of the court-house. The 1896 station back of the hotel was reoccupied and a new station was established in the Dallam lot, back of the jail. Belair is in the midst of great regional disturbances, and a small change in the position of the station will produce large changes in the magnetic elements.

Harford County, Belair, 1897.—In the garden back of Rouse House, a hotel, 110 paces back of the house, 41 paces north of south barbed wire fence, and 34 paces west of east fence at a point where stands a small willow tree. The above hotel is now known as Eagle Hotel.

Harford County, Belcamp, 1896.—On the farm belonging to Mr. James Walsh and occupied at present by Mr. E. J. Cottle, about 400 feet back of railroad station, 34 paces west of first locust tree, 25 paces south of wild cherry tree, and 29 paces west of hay crib blown down by storm.

Harford County, Cardiff, 1897.—Region of serpentine quarries. In 1897 eleven additional stations in vicinity were occupied for the purpose of mapping out the disturbed area. At most of the additional stations simply the dip was observed.

Harford County, Cardiff Railroad, 1896.—In open lot about 100 yards southeast of railroad

MARYLAND—Continued.

station, 32 paces from the white wooden fence, and 8 paces from fence near road. (In 1897 additional stations were obtained in Cardiff and vicinity. Marked local disturbances were encountered.)

Harford County, Peerless quarry, 1897.—On the property of the Peerless slate quarry, about 1 mile east of Cardiff.

Harford County, Schoolhouse, 1897.—Cardiff schoolhouse lot. The station is in the back lot and is marked by a hole cut in the largest gray stone sticking out of the ground.

Harford County, Boundary, 1897.—On mine hill (serpentine rocks) about 27 feet west of State boundary stone (date, 1774).

Harford County, Churchville, 1897.—In the orchard back of Churchville hotel, owned by Lawrence Forwood, and between the first two apple trees.

Harford County, Dublin, 1897.—The station was in the field back of the hotel and was purposely placed on the largest gabbro rock jutting out of the ground. The desire was to ascertain the effect from these rocks. It will be seen that the elements are disturbed, the declination, for example, being about 4° too high. The surveyor should make no use of the values given for this place.

Harford County, Forest Hill, 1896.—In the large open lot of E. Tucker & Co., west of railroad depot, 200 paces from fence corner nearest the depot and 46 paces east-northeast of cherry tree.

Harford County, Havre de Grace, 1899.—Station is on the grounds between Havre de Grace light and the light-keeper's house, about in line with light and porch of house and 26 paces east of house. Precise point is a one-half inch hole drilled in a solid stone, flush with the ground, which at one time formed the northwest pier of a small dwelling. There is a similar stone 7 paces south, another 8 paces east, and still another 13 paces east.

Harford County, Highland, 1897.—In the field south of the Presbyterian church.

Harford County, Minefield, 1897.—Near Rigdon's abandoned iron-ore mines. The purpose of making observations at this disturbed place was to ascertain the amount of disturbance.

Harford County, Thomas Run, 1897.—On the farm of Major Caldwell, of Baltimore City, leased at present by John Lochary, 30 paces from the fence along main road and opposite the blacksmith shop.

Howard County, Ellicott City, 1896.—In the grounds back of public school upon the hill near the court-house and west of old Patapsco Institute, 40 paces back of frame school building near oak tree and 7 paces north of south wooden fence.

Ellicott City, 1900.—Observations were made on both ends of the meridian line on the grounds of the Patapsco Institute on the hill, a short distance from the court-house. The north stone is 22 feet from the north fence and 89 feet from the west fence.

Howard County, Lisbon, 1899.—Near the southwest corner of schoolhouse lot. A graveyard adjoins the lot. The precise point is 19.3 feet from the west fence (wood), 23.6 feet from the south fence (wood), and 79.3 feet from the southwest corner of schoolhouse, a frame one-story building.

Kent County, Betterton, 1899.—Station is on the hill west of Betterton Hotel, owned by Mr. John Henry Crew. Precise spot is in line with chestnut tree, northeast side hill, and northeast corner of Mr. Crew's house, about one-third of the way from said tree. Point is marked by a wooden peg.

Kent County, Chestertown, 1897.—A true northeast and southwest line was marked permanently in 1897 in the grounds of the court-house. As there exists at this place a small artificial local attraction another station in the grounds of Washington College was occupied in order to obtain the corrections for the court-house station.

Kent County, Massey, 1896.—On the north side of road to Clayton, near small schoolhouse, about 1 mile from railroad station, 121 feet northwest of northwest corner of schoolhouse.

Kent County, Tolchester, 1897.—In the race-track field back of the picnic grounds.

Montgomery County, Cross Roads I, 1899.—The station is in a field belonging to Mr. Trundle and occupied by Mr. E. L. Heim. It is 84 paces from nearest corner of tobacco house and 48 paces from road. It is northwest of the tobacco house.

Montgomery County, Cross Roads II, 1899.—The station is situated on a large open field belonging to Mr. B. R. Codwise. It is 39 paces from the road and 195 paces from a tree near the center of the field. The station is northwest of the cross roads.

Montgomery County, Damascus, 1896.—On Dr. Lansdale's lot, 18 paces from west corner and 42 paces from small house at east corner.

MARYLAND—Continued.

Montgomery County, Derwood, 1899.—The station is located on the property of Mr. W. W. Stewart and occupied by Mr. H. E. Clark. It is marked by a stake which is 62.5 paces northeast of a cherry tree on the edge of the road and 65.5 paces from the northeast corner of the barn in the field.

Montgomery County, Dickerson, 1900.—The station is on the farm of Mr. Dickerson, about 500 feet directly north of the railroad depot, in the direction of Sugarloaf Mountain. It is 28 paces west of a clump of locust trees and 18 paces south of a fence.

Montgomery County, Forest Glen, 1896.—On the grass plat under maple tree east of road directly in front of Catholic cemetery.

Montgomery County, Gaithersburg, 1899.—The station is immediately in front of I. T. Falk's farmhouse. The point is marked with a stone below the surface of the ground with a cross on it. It is 38.6 feet from the front of the house and 23 feet from a cedar tree to the south and 19.2 feet from a cedar tree to east of north.

Montgomery County, Gaithersburg, I, II, III, 1899.—These stations are in the lot surrounding the International Geodetic Association latitude station.

Montgomery County, Gaithersburg, IV, 1900.—This is the magnetic observatory in same lot.

Montgomery County, Hunting Hill, 1899.—The station is in the field of Mr. I. B. Ward. It is marked by a stake which is 280.2 feet from the northeast corner of Mr. Ward's store and 381 feet from the southwest corner of his barn and stable.

Montgomery County, Linden, 1900.—In the middle of Prof. M. H. Doolittle's rear garden, 94.1 feet northwest of northeast corner of frame dwelling house and 84.1 feet northeast of northwest corner of same house. The station is marked by a sandstone post six inches square projecting 6 inches above the ground. A small hole drilled in the center of the upper surface of the stone marks the point. The primary azimuth mark was the extreme tip of the Chevy Chase standpipe, 3 miles distant; azimuth 39° 15′.7 west of true south. The secondary azimuth mark was the extreme tip of tower of Major Lawrence's house, about 200 yards distant; azimuth 66° 46′.8 west of true south.

Montgomery County, Middlebrook, 1899.—The station is located on land belonging to Mr. J. T. Buxton, at the intersection of the road to Waring and the road to Middlebrook. It is 37 paces from the large chimney and 63 paces from the kitchen chimney of the present house. The station is northeast of the crossroads and to the south of both chimneys.

Montgomery County, Quince Orchard, 1899.—The station is located in a field belonging to Mr. John T. Higden. It is 116 paces from a small apple tree at the road fence and 67 paces from the corner of a fence almost due west.

Montgomery County, Redland, 1899.—The station is near the road in a field belonging to Mr. Thomas F. Cashell. It is 136 paces from a large oak tree in the middle of the field and 46 paces to the fence, measuring directly toward a large cherry tree on the other side of the road.

Montgomery County, Rockville, 1897.—In middle of a field back of court-house, owned by Mr. Rabbitt and leased by Mr. Poss, who keeps a livery stable.

Rockville, 1900.—Observations were made over the south meridian stone in the academy grounds, distant 41 feet from the south fence and 93 feet from the west fence. The north meridian stone is 21.5 feet from the north fence and 96 feet from the west fence.

Montgomery County, Seneca, 1897.—In the large field belonging to Mr. John West, and northeast of crossing of canal over Seneca Creek. The station is 150 paces from the road and northeast of George Good's house, and near the south one of the two oak trees.

Montgomery County, Seneca, 1899.—The station is located in a field belonging to Mr. H. West. It is near the point where the Chesapeake and Ohio Canal crosses Seneca Creek, being several hundred feet from each of the above-mentioned bodies of water. It is 84 paces east of a large walnut tree and 97 paces southwest of a post near the corner of the field. It is north of the canal and east of the creek.

Montgomery County, Unity, 1896.—In the lot back of stable adjacent to Mr. Waters's store, rented at present by Mr. Schwartz; 26 paces east of Mr. Schwartz's milk house and 50 paces southwest of Mr. Clay Brown's brick house.

Montgomery County, Waring, 1899.—The station is located in a field of the Waring heirs, about 500 feet from the fence along the railroad cut and 330 feet from the fence along the road to south. It is also about 110 feet from the northwest corner of the garden.

MARYLAND—Continued.

Prince George County, Cheltenham.—At the Coast and Geodetic Survey Magnetic Observatory, on the grounds of the State Reform School.

Prince George County, Upper Marlboro, 1896.—In the southeast corner of the court-house grounds, down in the hollow; 13.9 feet west of maple tree and 88 feet from southeast corner of court-house, marked by a round 1¼-inch pine stub with a brass tack.

Prince George County, Upper Marlboro, 1900.—The south meridian stone is in the academy grounds, 75 feet from the front door of the academy building and 58 feet from the fence on the street. The north meridian stone is also in the grounds of the academy, on the edge of the bluff. From the south stone the cupola of the Southern Maryland Bank bears 42° 58′ east of true south.

Queen Anne County, Centerville, 1897.—In the grounds of the Centerville Academy for Boys, about one-eighth of a mile east of court-house, 62 feet south of south corner of academy, and 44 feet west of young sycamore tree.

Queen Anne County, Kent Island South Base, 1897.—Near the so-called South Base station of 1895. The 1897 station is in the field west of old dwelling house on the old Price farm. The farm is now owned by the National Bank of Centerville, and the present tenant is Mr. Palmer. The precise point is 100 paces southwest of present entrance to dwelling house, 39 paces from southwest corner of garden fence, and 45 paces north of row of three pear trees. The site of the monument marking the South Base station in 1845 is now about one half or three-fourths mile in the Chesapeake Bay.

St. Mary County, Leonardtown, 1896.—In the southwest corner of the court-house lot, 92 feet from southwest corner of court-house and 23¼ feet from southwest corner post of wooden fence.

Leonardtown, 1900.—The station is the south end of the meridian line in the court-house square. It is 9 feet from the wooden fence on south side and 9 feet from the west wooden fence. The north stone is about 300 feet distant.

St. Mary County, Mechanicsville, 1896.—In the garden of Hotel Mattingly, 18 feet northeast of mulberry tree and 9½ feet west of wooden fence. Dip station 5½ feet north of mulberry tree.

Somerset County, Crisfield, 1896.—In the large open lot west of the academy on Twelfth and —— street; 60 paces from southwest corner of academy (a frame building) in a line with rear side of academy.

Somerset County, Princess Anne, 1896.—In the southeast part of the spacious grounds around the new school building; 62 paces southeast of entrance to school, 40 paces north of large oak tree in southeast corner of lot, 10 paces west of east fence. These grounds have been the site of a schoolhouse for about one hundred years.

Princess Anne, 1900.—Observations were made over both ends of the meridian line, which is located in the high-school grounds. The south stone is 55 feet from the south fence, 95 feet from the east fence, and about 350 feet from the north stone.

Talbot County, Easton, 1897.—When establishing the meridian line in 1897 magnetic observations were made at various points. The station which is located in the fair grounds outside of the city is the one adopted in the magnetic survey.

Talbot County, Oxford, 1897.—Is near Mr. Schott's station of 1856. The station was on the beach in front of Sinclair's hotel.

Talbot County, Tilghmans Island, 1897.—In B. B. Sinclair's field back of Mrs. Lee's hotel, about 1 mile nearly north of the landing of the Baltimore, Chesapeake and Atlantic Railway steamers; about 20 paces east of Mrs. Lee's back fence and same distance south of road on the north side of Mrs. Lee's grounds. The island is about one-half mile wide at this point and the station is just about midway. The steamboat landing is on the east side of the island.

Washington County, Hagerstown, 1896.—In the grounds on the east side of the Hagerstown Academy, down on the slope near the second maple tree on the right-hand side of path to railroad station. The tracks of the Western Maryland Railroad are about 300 feet to the west and those of the Cumberland Railroad about 500 feet to the east. Site was chosen by the county surveyor, Mr. Piper. Marked by an ash stave which broke off when driven. Limestone rocks crop out of the ground.

Washington County, Hagerstown, 1900.—The station is the north stone of the United States Geological Survey meridian line on the almshouse farm, about 1¼ miles north of the city. The stone

MARYLAND—Continued.

is 296.5 feet east of the schoolhouse and 4 feet south of the fence line. The mark or range used was the lightning rod on the square tower of the almshouse, and bears 20° 26′.2 east of true south.

Washington County, Hancock, 1897.—In the large open field belonging to Mr. Brosius, north of railroad depot.

Washington County, Maryland Heights, 1897.—At extreme southern end of fort, in a small open space at end of path leading south from highest point of fort. (It was not easy to find the old Coast and Geodetic Survey station of 1870.) According to present indications it would seem to fall in a thicket of trees. I therefore chose the best site at present available. (L. A. B., July 27, 1897.)

Wicomico County, Parsonsburg, 1896.—In open lot, 170 paces south of Baltimore, Chesapeake and Atlantic Railroad station. Lot owned by proprietor of sawmill opposite station.

Wicomico County, Salisbury, 1896.—First station: On the grounds in front of the court-house, on the right-hand side of walk to entrance of court-house, about 14 feet south of south edge of this walk and 20 feet east of east edge of pavement. Brick buildings rather close. The second station should be given preference.

Second station: On the grounds of Mr. Thomas Humphreys, attorney at law, about 175 yards southeast of the court-house on the opposite side of Lake Humphreys. This is the site of the county meridian line established in 1896. Observations were made over the south monument and likewise 16 feet east of north monument, and is the preferable station. Site was chosen by Mr. Peter Shockley, county surveyor.

Worcester County, Berlin, 1896.—In the northwest corner of Buckingham High School grounds; 61.2 feet from the northwest corner of the frame building and 21.8 feet (at right angles) from the fence in the rear of grounds.

Worcester County, Ocean City, 1896.—Near life-saving station, 200 paces north and 200 paces west, in large, open, sandy area north of Bruce Cottage, northwest of schoolhouse, between Baltimore and Philadelphia avenues.

Worcester County, Pocomoke City, 1896.—In the northeast part of the grounds about the academy; 36 paces east of academy, 11 paces west of east hedge fence, and 25 paces south of north hedge fence.

Worcester County, Snow Hill, 1896.—In the southwest corner of the court-house lot: 61.8 feet from southwest corner of court-house, 6½ feet west of large sycamore tree. No fence around the lot, simply a stone curb. Station is 21.2 feet north of south curb and 15.2 feet east of west curb. Station too near to buildings.

Snow Hill, 1900.—Observations were made over both the meridian stones of the meridian line which is located in the circular race track just east of the town and the railway station. The south stone is 135 feet north of the south fence and 295 feet east of the west fence of the race-track property. The north stone is about 200 feet from the south stone.

MASSACHUSETTS.

Barnstable County, Provincetown, 1895.—Station is in the town park, on the hill in the rear of the Pilgrim House. Station is marked by a granite post 4 by 4 inches and 2 feet long, sunk flush with surface of ground. This stone is 60 feet a little east of north from the signal flag pole, and is also 60 feet from inner edge of fence along east side of park. The central rod on Wood End light-house bears 7° 10′ west of true south. The central rod on Highland light-house bears 82° 28′ east of true south, and the new town-hall spire bears 18° 43′ east of true south.

Berkshire County, Williamstown, 1898.—Station is in the grounds of what is known as the "Williams College Field Observatory," and is 150 feet west and 450 feet south of the transit circle. Station is marked by a copper bolt in a limestone post firmly set in ground and projecting about 6 inches above ground.

Essex County, Newburyport, 1898.—Station is 450 feet northwest of the Plum Island Hotel barn. It is just west of the road, among some sand hills.

Essex County, Salem (Fort Lee), 1897.—Station is on the covered way in center of old Fort Lee. The remains of the fort are to the right of the road to Hospital Point.

Middlesex County, Cambridge, 1895.—The station is located in the large open space in the east

MASSACHUSETTS—Continued.

side of the observatory yard, just north of the road that enters the yard on the east—the main entrance. Point is marked by a solid cedar post, with a copper screw.

Nantucket County, Nantucket Cliff, 1895.—Station is marked by a white-oak post distant 160 feet from the northwest corner of the porch of Charles H. Dauchy's house and 13.6 feet from the western boundary of the Dauchy property. Allen property on the west.

Plymouth County, Cromeset, 1887.—Geodetic and magnetic station is located on the first point to the northward of the extreme end of Cromeset Neck.

Suffolk County, Boston, 1890.—Station is the north meridian stone of the meridian line on Boston Common.

Suffolk County, South Boston, Castle Island, 1896.—Station is marked by a short granite block, sunk flush with surface. This block is about 13 centimeters square and has a ridge running north and south. This stone is 31.5 meters from the sea wall on the southeast side of island, and is also 133 meters from the extreme southeast point of Fort Independence and 107.7 meters from the northeast corner of brick hospital building. The mark or range used was Head House flag pole, Marine Park, City Point, and bears 68° 43′ west of true south.

Worcester County, Worcester, 1898.—Station is located on the larger of the two small islands in the lake of the institute park, just north of the Worcester Polytechnic Institute. Point marked with a granite post 4½ feet long, projecting 8 inches. South of this stone, in the grounds of the institute, a similar granite post was set, thus marking the true meridian. The mark or range used was the rod on the band stand, which bears 18° 02′.0 east of true south.

MICHIGAN.

Chippewa County, Sault Ste. Marie, 1891.—The station is northwest of the military post cemetery, 46.5 feet from the west fence of same and 101 feet from the fence forming the south boundary of the cemetery when prolonged. It is marked by a terra-cotta pipe sunk flush with the surface of the ground.

Kalamazoo County, Kalamazoo, 1900.—The station is located on the grounds of the Michigan Seminary building, to the northeast of the town. It is on the slope of the hill to the west of the main building, 29 feet north of the north edge of the road which is an extension of Bridge street. It is about 200 yards west of Seminary street, and is marked by a stone post 6 inches square, lettered on top U. S. C. & G. S., sunk flush with the surface of the ground. The southeast edge of the seminary building bears 41° 20′ east of true north.

Observations were also made at the old station in the park near the jail.

Marquette County, Marquette, 1891.—The station is on the United States reservation and near its western boundary and about 800 feet northwest of the light-house. It is on the summit of a knoll just north of the life-saving station. It is marked by a small terra-cotta pipe sunk so that its top is even with the surface of the ground. This pipe is 248.5 feet from the northwest corner of the life-saving station and 104.5 feet from the western boundary of the reservation.

Ottawa County, Grand Haven, 1891.—The station is on the south side of the court-house grounds, 21.10 meters from Franklin street and 44.10 meters from Fourth street. It is marked by a small terra-cotta drainpipe sunk flush with the surface of the ground.

St. Joseph County, Sturgis, 1900.—The station is located on the county farm, about 4 miles east of town. It is on a small knoll north of the poorhouse, 112.1 feet east of the west fence and 191.4 feet south of the north fence of the field. It is marked by a marble post 6 inches square, lettered on top U. S. C. & G. S., and sunk so as to leave 3 inches projecting above the surface of the ground. The mark or range used was the vertex of the cone on the top of the ventilator on the center of the poorhouse (the one between two chimneys) and bears 0° 56′ west of true south.

Wayne County, Detroit, 1900.—The station is on the southeastern shore of Belle Isle, in the Detroit River, about 200 yards west of the light-house. It is marked by a blue limestone post, 8 inches square, lettered on top U. S. C. & G. S. and sunk flush with the surface of the ground. This stone is 83.5 feet east of a flower bed, 75 feet from the river shore, and 64.5 feet from the edge of a driveway. The center of the pole on the light-house tower bears 77° 25′.9 east of true north.

MINNESOTA.

Becker County, Detroit City, 1900.—The station is located on the county grounds to the south of the town. It is 30.5 feet south of the inner edge of the old race track, 408.5 feet from the first tree west of the road at the southeast corner, and 424 feet from the southeast corner of the infirmary building. It is marked by a rough granite stone about 4 by 6 inches at the top, with intersecting grooves. The mark or range used was the southeast edge of the infirmary building and bears 85° 33′ west of true south.

Blue Earth County, Mankato, 1900.—The station is on the Normal School grounds, 25.15 feet from the inner edge of the board walk along West Fifth street and 38.75 feet from the nearest corner of the top step of the stone steps at the west side of the grounds. It is marked by a limestone post 8 inches square and lettered on top U. S. C. & G. S., sunk flush with the surface of the ground. The south edge of the Normal School building bears 73° 16′.5 west of true south, and the south edge of the court-house bears 25° 14′.5 west of true south.

Cass County, Walker, 1900.—The station is east of the Pameda Hotel, on the south side of the road, about 127 feet from the northeast corner of the wooden walk in front of it, and 1 foot south of the line of the outer edge of the walk. It is marked by a bowlder protruding through the sand, with intersecting grooves at the top. The mark or range used was the southeast edge of the chimney on the southwest corner of a flat-roofed house across the railroad track and bears 53° 58′.2 east of true north.

Clay County, Glyndon, 1900.—The station is the old one in the city park, 40 feet and 106.5 feet from the north and east fences, respectively. It is marked by a terra-cotta pipe sunk flush with the surface of the ground. The spire of Union church bears 38° 00′.4 east of true south.

Crow Wing County, Brainerd, 1900.—The station is at the intersection of Jumber street and Bluff avenue, three squares north of the railroad station and five squares west of Sixth street, on the edge of the town, overlooking the Mississippi River. It is 40 feet from the northeast corner, 27.6 feet from the line of trees on the north side of the street, and 44.4 feet from the center of the largest pine tree, about 30° east of south.

Dakota County, Buck Hill, 1893.—Near the triangulation station, on line to a windmill tower about 1½ miles distant.

Dakota County, Marcotta, 1893.—Near triangulation station, on line to a white church spire about 2 miles distant.

Dakota County, Wallace, 1893.—Near triangulation station, on line to a church spire in west St. Paul.

Dodge County, Mantorville, 1900.—The station is in the northeast corner of the court-house yard, 23 feet and 116.9 feet, respectively, from the inner edge of the board walk along the streets to the north and west of it. It is marked by a limestone post 7.7 inches square at the top, lettered U. S. C. & G. S., resting on solid rock. The mark or range used was the southwest edge of the wooden school building and bears 55° 53′.7 west of true north.

Douglas County, Alexandria, 1900.—The station is in the schoolhouse yard just east of the court-house, 86.65 feet east of the schoolhouse and 120.5 feet from the inner edge of the pavement along the street to the north. It is marked by a marble post 6 inches square, lettered on top U. S. C. & G. S., sunk flush with the surface of the ground. The mark or range used was an ornament on the east end of Mr. Brundage's house and bears 26° 32′.2 west of true south. The center of the flag-staff on the Letson House bears 20° 27′.4 east of true north.

Hennepin County, Hopkins, 1893.—About 40 feet from the triangulation station, on line to the Minneapolis Machine Company's works at West Hopkins.

Hennepin County, Minneapolis, 1891.—The station is on the grounds of the University of Minnesota, about 200 feet from the south corner of the main university building and about 50 feet north and 115 feet west of the longitude pier (1890, 1891) back of the library building. It is no longer suitable for magnetic work.

Jackson County, Heron Lake, 1900.—The station is in the race track grounds, 84.2 feet from the southeast corner of the judge's stand, 96.3 feet and 139.25 feet from the 11th post south and north of it, respectively, and 4⅓ feet from the south side of the grand stand. It is marked by a tent peg.

Lincoln County, Lake Benton, 1900.—The station is in the schoolhouse yard, 42.30 feet from the

MINNESOTA—Continued.

inner edge of the board walk on the street to the west of the building and 22.05 feet from the south edge of the board walk leading from the front of the building. It is marked by a hickory peg sunk even with the surface of the ground.

Polk County, Crookston, 1900.—The station is on the south side of West Fifth street, just west of Front street, 36.8 feet from the board walk on West Fifth street and 55.7 feet from the southeast corner of the yard surrounding the Riverside Hospital. It is marked by a granite post 6.2 inches square at the top, lettered U. S. C. & G. S., projecting 1 inch above the ground. The mark or range used was the lightning rod on top of the schoolhouse and bears 41° 04′.6 east of true south.

Ramsey County, Mound View, 1893.—Near the triangulation station, on line to a tall water tower at the stock yards.

Ramsey County, Prospect Park, 1893.—About 60 feet from the triangulation station, on line to the dome in the fair grounds.

Ramsey County, Ramsey, 1893.—About 25 feet from the triangulation station, on line to the center of 3 tall chimneys.

Ramsey County, St. Paul, 1891.—The station is in Oakland Cemetery, in the large open space just west of the center of the "Lake," 186.5 and 441 feet, respectively, from the inner edge of the wall of the cemetery along Sycamore and Sylvan streets. It is marked by a dressed marble post 4 inches square, with intersecting grooves at the top, lettered U. S. 1891 C. S. and sunk flush with the surface of the ground. The center of the cross on the Lutheran church bears 77° 24′.7 east of true south. The spire of the chapel on the cemetery grounds bears 8° 20′.3 east of true north.

Ramsey County, St. Paul, 1900.—The station is "north base" of the base line on Snelling avenue, about halfway between Minneapolis and St. Paul. The mark or range used was the flagstaff on the cupola of the main building in the fair grounds, distant about 1 mile, and it bears 7° 15′.3 west of true south.

Stearns County, St. Cloud, 1900.—The station is on the edge of the Mississippi River, four squares north of St. Germain street, near Fifth avenue. It is 87 feet from the southeast corner of the tool house on the north corner of Fourth street and Fifth avenue, 28 feet from the middle of the latter and 15 feet from the edge of the river bank. It is marked by a red granite post 8.4 inches square, lettered on top U. S. C. & G. S. The mark or range used was the east edge of the iron smokestack in Sauk Rapids, about 2 miles distant, and bears 11° 54′ west of true north.

St. Louis County, Duluth, 1891.—The station is on United States land just in the rear of the light keeper's house, 133.6 feet from its foundation and 34 feet from the shore of the lake. It is marked by a granite post 4 inches square, with a lead bolt and intersecting grooves at the top, projecting 2 inches above the ground. The spire of the Masonic Temple bears 15° 27′.7 west of true north. The center of the chimney of the light keeper's house bears 67° 04′.8 west of true south.

Swift County, Benson, 1900.—The station is located in the northwestern corner of the schoolhouse lot, 30.2 feet from the north fence, 41.8 feet from the line of trees to the west, and 106.2 feet from the northwest corner of the schoolhouse. It is marked by a wooden post sunk even with the surface of the ground.

Wabasha County, Lake City, 1893.—Near the triangulation station of that name, which is on the farm of Mr. Welp, between the crib and the pigpen.

Wabasha County, Watopa, 1893.—The station is 23.23 feet south and 75.8 feet west of the center of section 17.

Wadena County, Wadena, 1900.—The station is in the schoolhouse yard, 14.3 and 89.2 feet from the south and east fences and 24.5 and 108.8 feet from the lines of the east and south sides of the schoolhouse, respectively. It is marked by a brown sandstone post 6.6 inches square, lettered on top U. S. C. & G. S. and sunk flush with the surface of the ground. The mark or range used was the tip of the ironwork on top of the cupola of the Methodist church and bears 57° 42′.1 east of true south.

Washington County, Woodbury, 1893.—About 7.3 meters east of the triangulation station.

Wilkin County, Breckenridge, 1900.—The station is located in the court-house yard near the south fence between the fifth and sixth trees from the west and 6.4 and 9.15 feet from the center of the trees to the east and west, respectively, and 4.1 feet from the fence. It is marked by a wooden post sunk even with the surface of the ground.

MINNESOTA—Continued.

Yellow Medicine County, Granite Falls, 1900.—The station is located among the granite rocks one square west of the principal street, on the north side of the side street on which the truck and ladder house and the Merchant's Hotel are located. Just north of the highest point of the rocks is a small level place and the station is near the center of it. It is 6.8 feet from a well-worn path to the north and 37.6 feet west of the fence around the last house on the north side of the street, nearly opposite the truck and ladder house. It is marked by a wooden peg.

MISSISSIPPI.

Adams County, Natchez, 1890.—Station is located on the bluff north of the city and just opposite the Jewish burying grounds, on land owned by Mr. Charles Schlect. Station is marked by a locust post 2 feet long sunk flush with surface. This post is 20.8 feet south of the north fence of Mr. Schlect's property and 68 feet from the northwest corner. The mark or range used was the center of the cross on the Cathedral and bears 11° 51′.3 west of true south. Center of stand pipe of city water-works bears 5° 23′.8 west of true south.

Clay County, West Point, 1901.—The station is in the western part of the town, on the grounds of the Mary Holmes Seminary. It is marked by a stone post 6 inches square projecting 4 inches above the surface of the ground. This stone is 156.4 feet from the southeast corner and 203.1 feet from the southwest corner of the main building. The mark or range used was the apparent west edge of the chimney on a cotton mill, distant about 3 miles, and bears 2° 13′.4 east of true south.

Hancock County, Shieldsboro, 1896.—Station is in the southwest corner of the court-house square and is marked by a yellow-pine post 2 feet long, sunk flush with surface of ground. This post is 120 feet from the southern fence and 14 feet from the western fence around the court-house square. The mark or range used was the spire of the Catholic church and bears 13° 08′.9 east of true south. Spire of Methodist church bears 39° 00′.4 west of true north. Spire of court-house bears 55° 17′.3 east of true north.

Harrison County, Mississippi City, 1896.—Station is in the park in front of the Gulf View Hotel, on the hill overlooking Mississippi Sound, and about 2 squares from the court-house. It is marked by a yellow-pine post 2 feet long, sunk flush with surface of the ground. This post is 80 feet from the southern fence and 75 feet from the western fence of the park. The mark or range used was the flag pole on head of Gulf View Hotel pier and bears 6° 31′.2 east of true south. End of White's pier head bears 48° 17′.6 west of true south. End of Faye's pier head bears 89° 32′.8 east of true north.

Hinds County, Jackson, 1901.—The station is about 2 miles from the town, on the grounds of the Millsaps College, on the south side of Observatory Hill, about 300 feet from the proposed site for the observatory and 224.5 feet from the fence on the west. It is marked by a stone post 6 inches square, projecting 3 inches above the surface of the ground. The mark or range used was the spire on the main college building and bears 8° 10′.4 east of true south.

Jones County, Ellisville, 1901.—The station is about one-half mile from the center of the town, on the grounds of Mr. Bynum. It is about in the center of a large field back of his house, 222 feet from the east fence and 290 feet from the north fence. It is marked by a stone post 6 inches square, projecting several inches above the surface of the ground. The mark or range used was the spire of the Methodist church and bears 68° 49′.9 west of true north.

Lafayette County, Oxford, 1901.—Station is located on the summit of the flat hill used by students of the University of Mississippi as their baseball grounds. The spot is marked by a stone post 6 inches square, sunk flush with the surface of the ground. The post is distant 186.7 feet from the fence along the road to the east and 206.6 feet from the fence at the north. The mark or range used was the top of the water tower and bears 31° 21′ west of true north.

Lauderdale County, Meridian, 1901.—The station is about 2 miles from the town, on the grounds of the State Asylum for the Insane. It is about 150 feet south of the walk leading to the front of the main building and 260 feet from the southeast corner of this building. It is marked by a stone post 6 inches square, projecting 3 inches above the surface of the ground. The mark or range used was the staff on the Central school building and bears 76° 03′.3 east of true south.

Lee County, Tupelo, 1901.—The station is in the northwestern part of the town, on Jefferson street, in the grounds of the public school. It is 86 feet from the east fence, and 218.4 feet and 241 feet, respectively, from the southeast and southwest corners of the schoolhouse. It is marked by a stone post 6

MISSISSIPPI—Continued.

inches square, sunk flush with the surface of the ground. The mark or range used was the spire of the First Baptist church, on the corner of Jefferson and Church streets, and bears 87° 04′.2 east of true south.

Lincoln County, Brookhaven, 1901.—The station is on the campus of the Whitworth Female College. It is east of the main building and about in the center of the campus. It is 95.7 feet east of the main building and 89.1 feet north of the south fence. It is marked by a stone post 6 inches square, projecting 4 inches above the surface of the ground. The mark or range used was the spire on the Presbyterian church, at the junction of the iron vane and the main spire, and bears 2° 21′ east of true south.

Marshall County, Holly Springs, 1901.—The station is about 2 miles from town, on the grounds of Rust University. It is 236.5 feet and 212.7 feet, respectively, from the southeast and southwest corners of the University building. It is marked by a stone post 6 inches square, projecting 3 inches above the surface of the ground. The mark or range used was the top of the water tower and bears 3° 09′.4 east of true south.

Montgomery County, Winona, 1901.—The station is in the public school grounds on College avenue. It is 188.4 feet and 201 feet, respectively, from the northwest and northeast corners of the schoolhouse and 152.3 feet from the fence on the east. It is marked by a stone post 6 inches square, sunk flush with the surface of the ground. The mark or range used was the spire on the Methodist church, and bears 43° 10′.7 east of true south.

Pearl River County, Poplarville, 1896.—Station is in the southwest corner of the court-house square, and marked by a yellow-pine post 2 feet long, sunk flush with surface of ground. This post is 36 feet from the west fence and 50 feet from the south fence around court-house square. The mark or range used was the spire of the Methodist church, and bears 15° 34′.6 east of true south. Spire of Baptist church bears 80° 34′.6 east of true north. Cupola of court-house bears 22° 06′.9 east of true north.

Scott County, Forest, 1901.—The station is about one-fourth mile from the court-house, on the grounds of Mr. A. B. Carroll. It is in a large open field, 276.3 feet from the fence on the west. It is marked by a stone post 6 inches square, projecting 3 inches above the surface of the ground. The mark or range used was the cupola of the court-house, and bears 37° 54′.7 west of true south.

Warren County, Vicksburg, 1890.—Station is about the center of the last level plateau, at the extreme southeastern extremity of Castle Hill (near waterworks tower). It is marked by a locust post sunk 2 feet in the ground and flush with surface. This post is 107.5 feet from the south corner of the wooden inclosure of the house, which belongs to the Bowmar estate. From the east corner of same it is distant 123 feet. Spire of Trinity Episcopal church bears 10° 55′.9 east of true north. Spire on Baptist church bears 0° 52′.1 west of true north. Spire on the Catholic cathedral bears 4° 34′.1 west of true north.

Washington County, Greenville, 1890.—Station is in large open square, at the intersection of Main and Poplar streets, and near the center of the town. It was marked by a red-cedar post sunk 2 feet in the ground and flush with the surface. Station is distant 57 feet, 78.4 feet, and 100 feet, respectively, from the southeast fence of lot, southwest fence of lot, and eastern edge of Poplar street. It is also about 300 feet from Main street. Flag pole on Wilczinski building bears 41° 30′.9 east of true north. Center of cupola on ice factory bears 56° 11′.1 west of true north. Center of central chimney of Mr. J. Wall's house bears 52° 53′.9 west of true south.

Yazoo County, Yazoo City, 1901.—The station is about 1 mile from the town, in Lintonia Park. It is 149.8 feet from the north fence and 102.1 feet from the west fence, along Jackson avenue. It is marked by a stone post projecting 2 inches above the surface of the ground. The mark or range used was the cupola of Mr. Stubfield's house, and bears 36° 05′.4 east of true south.

MISSOURI.

Cass County, Harrisonville, 1900.—The station is in the southwest corner of the high-school grounds, 7 feet from the south side and 43 feet from the west side of the grounds. It is marked by a white limestone post 6 inches square on top and lettered U. S. C. & G. S., extending 2 inches above the ground. The mark or range used was the southeast corner of Mr. William Crosswhite's house, and bears 47° 30′.3 west of true south.

MISSOURI—Continued.

City of St. Louis County, St. Louis, 1900.—The station is on the baseball grounds in Forest Park, about 500 feet southeast of the police substation. It is marked by a limestone post 6 inches square on top and lettered U. S. C. & G. S., sunk even with the surface of the ground. The mark or range used was the middle of the foot of the flagstaff on the police station, and bears 22° 02′.1 west of true north.

Gasconade County, Hermann, 1900.—The station is on Plusts hill, southeast of the depot. It is on land owned by the city. It is 48.2 feet south of the fence running east and west across the hill. It is marked by a gray limestone post 6 inches square on top and lettered U. S. C. & G. S., extending 4 inches above the ground. The mark or range used was the flagstaff on the Stone Hill Wine Company's building, and bears 58° 15′.7 west of true south.

Iron County, Ironton, 1890.—A pier, built of brick laid in cement, was erected about 100 meters northeast of St. Louis, Iron Mountain and Southern Railroad depot, in a field belonging to the Pilot Knob Car and Steel Company. Two meridian stones were set, one 92.58 meters north of the pier, 4 feet from the fence, and near the tenth post from the corner by the footbridge; the other 118.24 meters south of the pier, 3 feet from the fence. A drill hole in each stone marks the exact points. Declination observed at the north meridian stone was 1° 55′; at the south stone 2° 30′ east.

Jackson County, Kansas City, 1900.—The station is located in Elmwood Cemetery, in block 3, midway between the northeast corner of lot No. 90 and the southeast corner of lot No. 108. It is marked by a white marble post 6 inches square on top and lettered U. S. C. & G. S., sunk 1 inch below the surface of the ground. The mark or range used was the tip of the east end of the roof of a frame house, and bears 64° 08′.3 west of true south.

Livingston County, Chillicothe, 1900.—The station is on the grounds of the State Industrial Home for Girls. It is east of the main building 450 feet and south of the fence along Third street 91.5 feet. It is marked by a gray limestone post 6 inches square on top and lettered U. S. C. & G. S., extending 2 inches above the ground. The mark or range used was the tip of the tower on the Industrial Home Schoolhouse, and bears 90° 07′.3 west of true south.

Macon County, Macon, 1900.—The station is in Oakwood Cemetery, in the northeast quarter of the ornamental circle near the gate, 4½ feet east of the path running north and south through the circle and 39.5 feet from the north edge of the circle. It is marked by a white limestone post 6 inches square on top, and lettered U. S. C. & G. S., sunk even with the surface of the ground. The mark or range used was the southwest corner of the frame house belonging to Mr. Edward Thompson, and bears 45° 09′ east of true north.

Marion County, Palmyra, 1900.—The station is in the new city cemetery in the driveway called Eighth avenue, near the west fence line. It is 24.4 feet from the northeast corner of the Smith lot and 26.5 feet from the southeast corner of the Thürwächter lot. It is marked by a white limestone post 6 inches square on top, and lettered U. S. C. & G. S., sunk 1 inch below the surface of the ground. The mark or range used was the spire of the Catholic church, and bears 9° 06′.5 east of true south.

Morgan County, Versailles, North Base, 1897.—The station is about 5 miles north-northeast of Versailles, in the southern part of the W. ½ S. W. ¼ sec. 9, T. 43 N., R. 17 W., of the fifth principal meridian, on land owned by Moses H. Tipton. It is marked by a block of stone 25½ inches thick, with the inscription U. S. C. & G. S., 1897, cut on its top surface, and has a copper bolt and cross lines in the center.

Pettis County, Sedalia, 1900.—The station is on the campus of the George R. Smith College, 223.5 feet south and 37.2 feet east of the southeast corner of the building. It is marked by a gray limestone post 8 inches square on top, and lettered U. S. C. & G. S., sunk even with the surface of the ground. The mark or range used was the tip of the courtrhouse tower, and bears 47° 51′.8 west of true south.

Schuyler County, Lancaster, 1900.—The station is in the Odd Fellows cemetery, near the northwest corner. It is midway between the northwest corner of lot No. 2, sec. 5, and the northeast corner of lot No. 3, sec. 5. It is marked by a white limestone post 8 inches square on top, and lettered U. S. C. & G. S. sunk 1 inch below the surface of the ground. The mark or range used was the spire of the Christian church, and bears 56° 20′.9 west of true south.

Washington County, Potosi, 1890.—A pier was built in the court-house grounds on the north side

MISSOURI—Continued.

of the building and southwest of the jail. This pier rises 3 feet above the ground and is capped by a stone, a drill hole in which serves to mark the south end of a meridian line. A north meridian stone, with center similarly marked, was set in the curb line near the northwest corner of Church and Mine streets at the southeast corner of the yard of Mr. James Long. A drill hole was also placed in the coping of the court-house 19 feet 2 inches from the northwest corner, in the meridian.

MONTANA.

Cascade County, Cascade, 1896.—Observations were made over a pine stub. This pine stub was located in the open space on the west side of the town, 1,086 feet west of the Great Northern, or the Montana Central Railway track, and 303 feet north of the Cascade public school building.

Choteau County, Fort Benton, 1896.—Observations were made over the center of a pine stub. This pine stub was located in the open space northeast of the town and down the river. It is between Main street and the Missouri River, 577 feet from the river, 80 feet southeast of Main street, 641.6 feet north of the site of the old fort.

Choteau County, Havre, 1896.—Observations were made over the center of an oak post. This oak post was located in the open space in the southeast corner of the block bounded on the east side by First avenue and on the south side by Third street. It is 38.5 feet west of First avenue, 28.5 feet north of Third street, about 220 feet northeast of the Havre public school brick building, and 240 feet east of the Methodist wooden church building.

Custer County, Forsyth, 1896.—Observations were made over a point in a large open space on the south side of the railway track southeast of the passenger station and about 300 feet from the foot of the bluffs. It is distant 1,131 feet almost south from the corner of secs. 22 and 23, T. 6 N., R. 40 E. It is also distant 1,516 feet from the nearest point of the railway roundhouse.

Custer County, Miles City, 1896.—Observations were made over the center of an ash stub. This ash stub was located in the City Park. It is distant 173 and 232 feet, respectively, from the inner edge of Park street and from the nearest bank of Tongue River. It is also distant about 425 feet from the center of the main building of the Macqueen Hotel, which is near Park street, and the railway station.

Dawson County, Glendive, 1896.—Observations were made over the center of a pine stub. This pine stub was located on the south side of the town, on a large vacant lot belonging to the Northern Pacific Railway Company, bounded on the northeast by Power street and on the southeast by Nowlan avenue. It is 232.5 feet west of center of front projection of dwelling of superintendent of Northern Pacific Railroad and 104.5 feet southwest of the inner edge of Power street.

Flathead County, Kootenai River at Canadian boundary, 1901.—Observations were made on the second bench east of the river about 100 feet south of the line joining Boundary monuments Nos. 9 and 10. The precise point is 324 meters west and about 30.5 meters south of Monument No. 9. The instrument was mounted on a stump.

Flathead County, Tobacco Plains, 1901.—This station is about a quarter mile south of Phillipps, British Columbia, and is 180 feet east and 26.4 feet south of Boundary Monument No. 8 American, No. 154 British. The station is 37 feet due south of an iron post having on top a brass cap lettered U. S. Survey. 1901, Az: Sta. This post is the south end of a meridian line.

Flathead County, Wigwam, 1901.—The station was located near the center of the little valley through which Wigwam Creek flows. At this season, September, 1901, no water is in the bed of the stream. Observations were made in the vista which was cut for the forty-ninth parallel. The precise point was 251 meters west of Boundary Monument No. 6 and 416 meters east of Monument No. 7.

Gallatin County, Bozeman, 1896.—Observations were made over the center of a pine stub. This pine stub was located about one-half mile south of the city, 70 feet east of Central avenue, 190 feet south of Jesse Stiff's house, about 200 feet northeast of F. T. Osborne's house, about 500 feet north of H. W. Rice's house, and about 400 feet northwest of Bozeman Creek at its nearest point. The center of the cupola of the high school bears 13° 36′.3 west of true north. The cupola of the Episcopal church bears 5° 58′.7 east of true north. The cupola of the Bozeman Hotel bears 23° 25′.7 east of true north.

Gallatin County, Fort Ellis, 1882.—The station is about in the center of the parade grounds.

MONTANA—Continued.

Lewis and Clarke County, Helena, 1896.—Observations were made over the center of a pine stub. This pine stub was located near St. Joseph Catholic Orphan Asylum, about 1 mile north of the city limits. It is 453 feet east of the inner edge of Montana avenue extended, 78 feet north of the plank fence around the asylum grounds, about 250 feet northeast of the northeast corner of the asylum building. The mark or range used was the north side of the public school dome, and bears 32° 04′ west of true north.

Meagher County, Townsend, 1896.—Observations were made over a pine stub. This pine stub was located in the large open space on the north side of the town, on land claimed by the Northern Pacific Railway. It is 106 feet east of the inner edge of Pine street extended, 165 feet northeast of J. E. Kanouse's residence, about 250 feet southwest of J. R. Marks's house, and about 650 feet northeast of the main irrigation ditch where it crosses Pine street. The spire of the Methodist church bears 21° 19′.7 east of true south. The spire of the public schoolhouse bears 11° 24′.3 west of true south.

Valley County, Glasgow, 1896.—Observations were made over the center of a pine post. This pine post was located in the large open field on the south side of the town. It is 412 feet due south of the county court-house and 580 feet east of the east side of the race track. The mark or range used was the Glasgow public school flagstaff. This mark or range bears 23° 12′.8 east of true north.

Yellowstone County, Billings, 1896.—Observations were made over a point located on the west side of the town of Billings, 112 feet northwest of the northwest side of Third avenue north and 84.5 feet southwest of the southwest side of Thirty-second street. It is 1 000 feet south and 1 200 feet west of section corner 32 and 33, T. 1 N., R. 26 E. This corner is on the base line of the original land survey.

NEBRASKA.

Antelope County, Neligh, 1900.—Observations were made over a sandstone post 26 inches long, set 26 inches in the ground, 5 by 7 inches on top, and lettered U. S., with a small hole in the center marking the point. This stone is located in the court-house square and distant 110 and 120.6 feet, respectively, from the northeast and the northwest corners of the court-house building. The mark or range used was the cupola of the tower of the water standpipe on a hill about one-half mile distant. This mark or range bears 7° 11′.6 west of true north. The spire of the Methodist church bears 56° 48′.4 east of true south. The cross on the Episcopal church bears 34° 46′.8 east of true south.

Banner County, Harrisburg, 1900.—Observations were made over a sandstone post about 3 feet long, set 27 inches in the ground, 6 by 6 inches on top, and lettered U. S. C. & G. S., with a small hole marking the center. This stone was placed on a small hill immediately west of the town, and a little north of the spot where a well has been dug for the water supply of the town. This town is located in sec. 2, T. 18, R. 56. The mark or range used was the cupola of the frame court-house about one-fourth of a mile distant. This mark or range bears 81° 15′.8 east of true north. The bold perpendicular face of the bluff 2 miles distant and known as "Lover's Leap" bears 1° 24′.2 west of true south. The cupola of the frame schoolhouse bears 84° 17′.2 east of true north.

Blaine County, Brewster, 1900.—Observations were made over a gray sandstone post 3 feet long, set 32 inches in the ground, 6 by 6 inches on top, and lettered U. S. C. & G. S., with a small hole in the center marking the point. This sandstone post was placed in the northwest corner of the court-house grounds, and one-fourth of a mile south of the town of Brewster. An iron rod 1 inch in diameter was driven in the ground 137.4 feet from the stone post. The mark or range used was the rod of a windmill pump about one-fourth of a mile distant. This mark or range bears 3° 06′.8 east of true north. The iron rod bears 3° 08′ east of true south. The center of a chimney of a white frame house bears 73° 54′.8 east of true north. The south gable of the frame schoolhouse bears 68° 18′ west of true north.

Boone County, Albion, 1900.—Observations were made over a sandstone rock 36 inches long, set 36 inches in the ground, 8 by 8 inches on top, and lettered U. S. C. & G. S., with a small hole in the center of it marking the point. It was placed in the northeast corner of the court-house square, about 88.3 feet from the west side of Fourth street and about 34 feet from the south side of Church street. This stone is distant 65.5 feet from the top of the stone foundation of the court-house at its northeast corner. It is nearly due north of the center of the first step leading into the court-house

NEBRASKA—Continued.

building, and 102.2 feet from it. The mark or range used was the base of the cross on the tower of the Baptist church. This mark or range bears 28° 04′.5 east of true south. The spire of the Presbyterian church bears 51° 58′.4 west of true south.

Boxbutte County, Alliance, 1900.—Observations were made over a sandstone post 3 feet long, set 33 inches in the ground, lettered U. S. C. & G. S., with a small hole marking the center. This stone post was placed in the circle of the new race track west of the town, on the south side of Montana avenue when extended to the west, and about 100 feet north of the judges' box. The mark or range used was the rod of a windmill pump. This mark or range bears 4° 37′.4 west of true south. The top of the water standpipe bears 56° 38′.5 east of true north. The cupola of a large brick schoolhouse bears 61° 41′.7 east of true north. The cross upon the tower of the Catholic church bears 81° 17′.1 east of true north. The center of the brick chimney of the railroad shops bears 52° 17′ east of true south.

Brown County, Ainsworth, 1900.—Observations were made over a sandstone rock 3½ feet long, set 39 inches in the ground, 5 by 5 inches on top, and lettered U. S. C. & G. S., with a small hole which marks the center. This stone post was placed in the court-house grounds 79.3 feet directly east of the northeast corner of the brick court-house building. The mark or range used was the base of the iron rod supporting the gilt ball upon the tower of the Methodist church about 300 yards distant. This mark or range bears 1° 56′.8 west of true south. An iron pipe was driven in the ground in line to the iron rod on the Methodist church tower and distant 209.75 feet. The tip of the cupola upon the northwest corner of the brick bank building bears 6° 17′ east of true south. The tip of the spire of the German Lutheran church bears 39° 34′.2 west of true north.

Cherry County, Kennedy, 1900.—Observations were made over a sandstone post 3 feet long, set 32 inches in the ground, 6 by 6 inches on top, lettered U. S. C. & G. S., with a small hole which marks the center. This stone was placed near the store of David Steadman in Kennedy. It is southwest of the store and 100 feet southeast of a new set of wagon scales. The mark or range used was an iron rod 4 feet long and 2 inches in diameter, driven about 3½ feet in the ground. It was located about 500 feet from the station, on a hill north of a barn in a direct line with the scale box of the wagon scales. This mark or range bears 17° 01′.9 west of true north. The rod of a windmill pump at the barn bears 32° 12′.5 west of true north. The white cross on the church 2 miles away bears 76° 28′.7 west of true south. The south corner of the brick chimney on the store bears 28° 57′.1 east of true north.

Cherry County, Merriman, 1900.—Observations were made over a copper nail driven in a red-cedar post 3 feet long, set 32 inches in the ground. This cedar post was placed on Government land in the SW. corner sec. 17, T. 34, R. 37. It is located on a sand knoll about 200 yards south of the railroad, and not more than 200 feet from the supposed section corner. The mark or range used was the cupola of the schoolhouse. This mark or range bears 13° 27′.9 west of true north. The center of the brick chimney of the Fremont, Elkhorn and Missouri Valley Railroad station bears 12° 32′.3 west of true north. The rod of the railroad windmill pump bears 1° 56′.7 east of true north.

Cherry and Sheridan counties, Spring Lake Ranch, 1900.—Observations were made over a copper nail in cedar post 3½ feet long, set 3 feet in the ground. This cedar post was placed upon an earth mound on the seventh standard parallel, and near the fifth guide meridian at a jog in the line between Cherry and Sheridan counties, and north of the line of township No. 28. It is about 4 feet west of the triangular cedar stake set some thirty years ago when the original townships were laid off. This stake is one of the corners of Spring Lake Ranch. It is on the face of a ridge sloping west, near the top and in a small hollow west of one of the higher knobs of the hill. It is directly east of the Spring Lake meadow known as Billy's Lake. Another cedar stake was driven on a sand hill 222.1 feet northwest of station. This cedar post bears 42° 37′.5 west of true north. The south gable of a small house on the north side of the valley bears 83° 24′.6 west of true north.

Cherry County, Valentine, 1900.—Observations were made over a sandstone post 3 feet long, set 33 inches in the ground, and lettered U. S. C. & G. S., with a small hole which marks the center. This sandstone post was placed in the block on which stands the new brick schoolhouse, district No. 1. It is located on the eastern edge of the town within about 100 yards of the western boundary of the United States military reservation, north of the northwest corner of the school building. The mark

NEBRASKA—Continued.

or range used was the spire of the Methodist Episcopal church. This mark or range bears 59° 39′.3 west of true south. The cross on the Episcopal church bears 82° 43′.7 west of true north. The spire of the Presbyterian church bears 79° 06′.7 west of true north. The northwest corner of the stone foundation of the school building bears 1° 25′.5 east of true south.

Cheyenne County, Bridgeport, 1900.—Observations were made over a stone post in the SE. ¼ SE. ¼ sec. 31, T. 20, R. 50. It was located on the level land west of the town and north of the Burlington and Missouri River Railroad tracks, and 100 feet north of the stock yards. The mark or range used was the center of a house. This mark or range bears 76° 35′.5 west of true north. The tip of the Burlington and Missouri River Railroad water tank bears 33° 08′.3 east of true south. The tip of Chimney Rock, 6 miles distant and known as such since 1849, bears 78° 41′.1 west of true north. The eastern face of "Jail Rock," 4 miles distant and east of a larger one known as "The Court-House," bears 5° 26′.7 west of true south.

Cheyenne County, Sidney, 1900.—Observations were made over a gray sandstone post 3 feet long, set on a solid rock, about 28 inches in the ground, 6 by 6 inches on top, and lettered U. S. C. & G. S., with a small hole which marks the center. This stone post was placed on the top of the bluff about one-fourth of a mile north of the Union Pacific Railroad station and the town of Sidney. This bluff is elevated about 100 feet above the town, and the land is the property of Robert S. Oberfelder. The post is about 20 feet from the point where the hill begins to slope toward the bluff, and the point of the cupola of the Union Pacific Railroad station is directly in line with the center of the arc formed by the gilt letters "Chowins" upon a new stone building one block south of the railroad station. The mark or range used was the point of the cupola of the railroad station. This mark or range bears 2° 06′.9 east of true south. The spire of the Lutheran church bears 6° 04′.4 east of true south. The Presbyterian church spire bears 4° 32′.8 west of true south. The spire of the Catholic church bears 18° 52′.1 west of true south.

Colfax County, Schuyler, 1900.—Observations were made over a marble post 3 feet long, set 31 inches in the ground, 6 by 6 inches on top, and lettered U. S., with a small hole which marks the center. It was placed in the court-house grounds about 35 feet south of the street running east and west in front of the building. It is distant 99 feet from the bottom brick of the northwest corner of the court-house building. A reference marble post, 18 inches long, set flush with the ground, and 4 by 6 inches on top, with a small hole which marks the center, was placed 168.4 feet from the first stone in a southerly direction from it, and 16.05 feet west of the southwest corner of the stone foundation of the court-house building, directly in line with the back walls of this building. The mark or range used was the gable of a shed roof about 200 feet from the station. This mark or range bears 1° 14′.2 west of true south. The reference stone bears 3° 33′.3 west of true south.

Custer County, Broken Bow, 1900.—Observations were made over a stone post 3 feet long, set 31 inches in the ground, 6 by 6 inches on top, with a small hole in the center marking the point. This stone post was placed in the northwest corner of the grounds of the South Side High School building, about 35 feet from the street south and the same distance from the street west of these grounds. It is 102 feet southwest of the southwest corner of the brick school building. The mark or range used was the cupola on the largest tower of the new brick court-house, about one-fourth of a mile distant. This mark or range bears 8° 03′.5 east of true north. The spire of the United Brethren Church bears 79° 51′.5 east of true north. The spire of the Baptist church bears 20° 21′.9 east of true north. The cupola of the North Side schoolhouse bears 13° 08′.1 east of true north.

Dawes County, Chadron, 1896.—Observations were made over the center of a pine stub. This pine stub was located in the court-house yard. It is distant 158.6 feet north of the north entrance to the county court-house, 31.8 feet south of the south side of Fourth street, and 145 feet west of the west side of Main street. The point used as a mark or range bears 89° 09′.8 east of true south.

Dawes County, Keystone Ranch, 1900.—Observations were made over a point on a knoll about 100 yards north of the ranch house, and between it and the irrigation ditch. The Keystone Ranch is owned by David Taylor, of Hay Springs, Nebr. It is in the northeast corner of sec. 23, T. 29, R. 48. The mark or range used was the rod of the windmill pump. This mark or range bears 14° 46′.3 west of true south.

Dawes County, Marsland, 1900.—Observations were made over a stone post placed on the high ground west of the town, about 300 feet south of the Presbyterian church, and nearly in line with the

NEBRASKA—Continued.

Baptist church, which is 800 feet south of this stone post. This town is said to be located upon the northwest corner of sec. 34, T. 29, R. 51. The mark or range used was the Baptist church spire. This mark or range bears 0° 42′.4 east of true south. The tip of the water tank of the Burlington and Missouri River Railroad bears 87° 07′.6 east of true north. The center of the west chimney of the Burlington and Missouri River Railroad station bears 84° 56′.8 east of true south. The cupola of the schoolhouse bears 2° 25′.4 west of true north. The spire of the Presbyterian church bears 4° 13′.6 east of true north.

Deuel County, Chappell, 1900.—Observations were made over a sandstone post 3 feet long, set 33 inches in the ground, 6 by 6 inches on top, and lettered U. S. C. & G. S., with a small hole marking the center. This stone post was placed on the land of Fred Sudman, county treasurer, upon the NW. ¼ NW. ¼ sec. 22, T. 13, R. 45. It is about 100 yards a little west of south of the Union Pacific Railroad station, and about the same distance east of south of the stock yards. The mark or range used was the rod of a windmill pump. This mark or range bears 7° 38′.6 west of true south. The rod on the spire of the Methodist church bears 39° 19′.3 east of true north. The cupola of a frame schoolhouse one-half a mile distant bears 24° 20′.4 east of true north. The rod of the Union Pacific Railroad windmill pump bears 21° 12′.3 east of true north.

Deuel County, Hartman, 1900.—Observations were made over a copper nail in hexagonal red cedar post 3 feet long, set 32 inches in the ground, and 6 inches in diameter. This cedar post was placed in the NW. corner sec. 35, T. 18, R. 44, and 149.8 feet from the stone marking this corner. It is about one-half a mile northeast of Sebastian R. Hartman's dwelling, and east of Lost Creek. This cedar post is about 130 feet east and 50 feet south, respectively, of the section roads. The mark or range used was the rod of Frederick Teppert's windmill pump, about one-half mile distant. This mark or range bears 9° 01′.3 east of true north. The corner stone of section 35 bears 51° 48′.2 west of true north.

Douglas County, Omaha, 1900.—Observations were made over a sandstone post 28 inches long, set just below the surface of the ground. This stone is pointed at the top and its center marks the point. It is located in Prospect Hill Cemetery, in the northwestern part of Omaha. This stone was placed in the open space adjoining the brick stone-capped wall, which runs along Parker street, and is distant 42.65 feet from this stone wall. It is also distant 122.4 and 122 feet, respectively, from the nearest corners of the Drexel and Enos Lowe monuments. The mark or range used was the spire of the United Presbyterian church. This mark or range bears 29° 11′.4 east of true south. The spire of the United States post-office bears 45° 08′.1 east of true south. The spire of the high school bears 36° 45′.2 east of true south.

Garfield County, Burwell, 1900.—Observations were made over a sandstone post 3.2 feet long, set about 3 feet in the ground, 6 by 6 inches on top, and lettered U. S. C. & G. S., with a small hole which marks the center. The stone post was placed upon the lot occupied by the public school building, in the western section of the town. It is distant 54.8, 42.6, and 24.0 feet, respectively, north of the frame school building, west of the street which runs north and south in front of this building, and south of the north side of the school lot. The mark or range used was a telegraph pole on the Burlington and Missouri River Railroad, one-half a mile distant. This mark or range bears 22° 27′.3 east of true south. The spire of the Congregational church bears 77° 55′.1 east of true north. The cross on the Catholic church bears 83° 58′.3 east of true south.

Grant County, Hyannis, 1900.—Observations were made over a sandstone post 3 feet long, set 33 inches in the ground, 6 by 6 inches on top, and lettered U. S. C. & G. S., with a small hole marking the center. This stone post was placed on land belonging to the Lincoln Land Company, about one-half a mile east of the corner stone marking townships 23 and 24 and ranges 38 and 39, and about 100 feet north of the south line of township No. 24. It is located upon the top of a sand hill, 75 feet above the town. It is north of the Burlington and Missouri River Railroad, and is 500 feet northwest of the railroad station. The mark or range used was the cross on the Catholic church spire. This mark or range bears 28° 04′.8 west of true south. The stone marking the southwest corner of township No. 24 and the northwest corner of No. 23 and the line between ranges Nos. 38 and 39, bears 92° 06′.5 west of true south. The Presbyterian church spire bears 27° 48′.2 west of true south. The tip of the bell tower on the schoolhouse bears 71° 52′.5 west of true south.

Holt County, O'Neill, 1900.—Observations were made over a white limestone post 32 inches long,

NEBRASKA—Continued.

set 29 inches in the ground, 4 by 4 inches on top, lettered U. S. C. & G. S., with a small hole marking the center. This stone was placed in the court-house square in line with the west face of the court-house building, and 69.1 feet south of the southwest corner of the brick foundation of this building. The mark or range used was the flag pole of a grocery store one-fourth of a mile distant. This mark or range bears 3° 15′.0 west of true south. The ball on the Methodist church spire bears 71° 42′.8 east of true south. The cross on the Catholic church spire bears 35° 10′.8 west of true north.

Hooker County, Mullen, 1900.—Observations were made over a sandstone post 3 feet long, set 30 inches in the ground, 6 by 6 inches on top, and lettered U. S. C. & G. S., with a small hole marking the center. This stone post was placed on a hill north of the town and railroad station, in the center of a lot owned by C. L. Inmann. It is about 300 yards north of the railroad station and about 250 yards east of the frame schoolhouse. An iron rod 3½ feet long was driven in the ground 30 feet north of the northwest corner of the frame court-house building and about one-fourth of a mile distant from this stone post. The mark or range used was this iron rod. This mark or range bears 32° 31′.9 west of true south. The flag pole on the cupola of the schoohouse bears 62° 06′.5 west of true south. The center of the chimney of the court-house bears 30° 58′.7 west of true south. The center of the chimney on the new hotel bears 11° 58′ west of true south.

Howard County, St. Paul, 1900.—The station is in the southeast corner of the court-house yard, 32.6 feet from the south fence and 66 feet 11 inches from the east fence. It is marked by a limestone post sunk 4 inches below the surface of the ground. The mark or range used was the flag pole on the schoolhouse, and bears 48° 07′.5 west of south.

Keith County, Ogallala, 1900.—Observations were made over a stone post 3 feet long, set about 33 inches in the ground, 6 by 6 inches on top, and lettered U. S. C. & G. S., with a small hole marking the center. This stone post was placed about one-fourth of a mile from the court-house, near a road on the south slope of a hill, and in line with the center of the street which runs north on the east side of the court-house grounds. The mark or range used was the iron rod upon the cupola of the brick court-house building. This mark or range bears 2° 07′.4 east of true south. The spire of the Catholic church bears 25° 13′.7 east of true south. The spire of the Presbyterian church bears 18° 34′.7 west of true south. The northwest corner of the brick schoolhouse bears 28° 29′.5 west of true south.

Keyapaha County, Springview, 1900.—Observations were made over a brass spike driven in a cedar post 3 feet long, set 34 inches in the ground, and 6 inches in diameter on top. It was located in the court-house square on the east side of the town 65.1, 90.6, and 161 feet, respectively, from the east fence, from the north fence of this square, and from the northeast corner of the stone vault near the court-house building. The mark or range used was the rod of the windmill pump one-fourth of a mile distant. This mark or range bears 15° 23′.7 east of true south. The center of the north chimney of the schoolhouse bears 71° 07.2 west of true north. The Methodist church spire at the base of vane bears 44° 41′.2 west of true north. The northwest corner of the stone vault 161 feet distant bears 55° 06′.6 west of true south.

Kimball County, Kimball, 1900.—Observations were made over a stone post 3 feet long, set 33 inches in the ground, 6 by 6 inches on top, lettered U. S. C. & G. S., with a small hole marking the center. This stone post was placed in the southeast corner of the schoolhouse grounds, about 35 feet from the south fence, 20 feet from the east fence of these grounds, and 200 feet from the new frame school building. The mark or range used was the tip of the water tank of the Union Pacific Railroad. This mark or range bears 9° 01′.6 east of true north. The southeast edge of John Biggs's stone store building on line with the window sills bears 27° 56′.6 east of true north. The point of the wooden bracket upon the north gable of the frame court-house bears 63° 36′.1 east of true south. The northeast edge of the schoolhouse building, corner just above the water table, bears 43° 53′.1 west of true north.

Lancaster County, Lincoln, 1900.—The station is on the south end of the athletic field of the State University of Nebraska, 100.9 feet west of the stone walk at west end of the main building and 69.8 feet north of the fence at south end of athletic field. It is about 6 inches south of the line of sight along the north side of the hallway of the main building and 4 inches west of the west face of the library building. It is marked by a sandstone post 6 inches square, lettered on top U. S. C. & G. S., and sunk even with the surface of the ground. The mark or range used was the east edge of a tall iron smokestack and bears 16° 32′.8 west of true north.

NEBRASKA—Continued.

Logan County, Gandy, 1900.—Observations were made over a sandstone post 3 feet long, set 32 inches in the ground, 6 by 6 inches on top, and lettered U. S. C. & G. S., with a small hole marking the center. This stone was placed on the hill about 1 200 feet south of the court-house, in line between the Presbyterian church and the schoolhouse, 172 feet from the former and about 191 feet from the latter. The mark or range used was the cupola on the court-house. This mark or range bears 6° 59′.3 west of true north. The cupola on the schoolhouse bears 77° 35′.9 east of true north. The rod of the windmill pump of B. Smith bears 89° 28′.1 west of true north.

McPherson County, Township 19, Range 37.—Observations were made over a brass tack in a red cedar post 4 inches in diameter and 3½ feet long, set in the ground. This cedar post is located on a ranch owned by B. Aufdenburger, in a meadow south of his house. The mark or range used was the rod of a windmill pump about 350 feet distant from the cedar post. This mark or range bears 14° 25′.6 west of true north. The southeast corner of the northeast quarter of section No. 10, distant 250 feet, bears 48° 49′.2 east of true south.

McPherson County, Tryon, 1900.—Observations were made over a copper nail in a cedar post 4½ inches in diameter and 4 feet long, set 3½ feet in the ground. This cedar post was located in a small valley at the foot of a hill, about one-fourth of a mile north of the frame court-house building. This small one-story court-house building, with one sod house, at the present time constitutes the town of Tryon. The county clerk, L. C. Renean, knows the exact location of this cedar post. The mark or range used was the rod on a windmill pump. This mark or range bears 16° 34′.3 east of true south. The center of the south or the main chimney of the court-house building bears 14° 53′.2 east of true south.

Madison County, Norfolk, 1896.—Observations were made over the center of a pine stub. This stub was located in the Lincoln public school grounds, 192.3 feet west of the west side of the school building, 45.3 feet from the plank fence on the west side of the school grounds, and 88.3 feet from the south side of the school grounds. The point used as a mark or range bears 75° 57′.5 east of true south.

Nuckolls County, Superior, 1900.—The station is in the southwestern corner of the city park, in the northeastern part of the town, 50 feet from the west fence and 118.5 feet from the south fence. It is marked by a hedge-wood stake.

Rock County, Newport, 1900.—Observations were made over a sandstone post 27 inches long, set about 2 feet in the gronnd, 4 by 4 inches on top, with a small hole in the center, which marks the point. This post is located in the schoolhouse grounds. It is distant 106.1 feet due south of the combined porch and bell tower of the schoolhouse, in line with the center of the building, and 40.2 feet from the north side of the road in front of the schoolhouse. This schoolhouse and lot is in the northwestern edge of the town. The mark or range used was the base of the iron rod on the Methodist church spire. This mark or range bears 80° 35′.0 east of true south. Observations were made in this same lot in 1896, about 190 feet north of this stone post.

Rock County, School Section No. 36, 1900.—Observations were made over a point about the center of school section No. 36, in Rock County, on land now under lease to William Martin. It was located in the meadow west of the Martin house, and is one-half mile north of the parallel marking the northern boundary of Loup County, and it is also 6½ miles west of the meridian line marking the eastern limit of Rock County. This valley is known as the Gracia Creek Valley, and is southeast of Butka post-office.

Scotts Bluff County, Gering, 1900.—Observations were made over a stone post located upon the open plain west of the town and between it and Scotts Bluff. It was placed 235.9 feet southwest of the southwest corner of the court-house and in the line of a street which, if opened, would pass south of the court-house building. This town is one-half mile south of the North Platte River and 1½ miles south of the Burlington and Missouri River Railroad station at Scotts Bluff. The mark or range used was the spire of the Methodist church. This mark or range bears 72° 39′.7 east of true north. The southwest corner of the brick court-house, distant 235.9 feet, bears 44° 12′.1 east of true north. The cross upon the spire of the Baptist church bears 57° 54′.1 east of true north. The smallest circular rock on "Dome Rock," the south part of Scotts Bluff, bears 74° 39′.6 west of true south.

Sheridan County, Rushville, 1900.—Observations were made over a sandstone post 3 feet long, set 33 inches in the ground, 6 by 6 inches on top, and lettered U. S. C. & G. S., with a small hole which marks the center. This stone post was located west of the town, upon the level ground 100 yards west

NEBRASKA—Continued.

of the most westerly buildings at this time, and west of a low piece of ground used as a ball ground. It is on the north side of Second street, if it were extended, and about 200 yards south of the Fremont, Elkhorn and Missouri Valley Railroad tracks. The ball on the top of the United Presbyterian church bears 36° 37′.2 east of true south. The flagstaff on the public school building bears 63° 26′.6 east of true south. The spire of the German Methodist church bears 64° 50′.8 east of true south. The Methodist church spire bears 71° 44′.7 east of true north. The flagstaff on the town waterworks bears 65° 39′.7 east of true north.

Sioux County, Harrison, 1900.—Observations were made over a sandstone post 3 feet long, set about 32 inches in the ground, 6 by 6 inches on top, lettered U. S. C. & G. S., with a small hole marking the center. This stone post was placed upon the level plateau about one-fourth of a mile southeast of the court-house, upon the lands of Andrew McGinley. It is 186.8 feet north of Mr. McGinley's new barn and 85.7 feet south of the fence upon the north side of his land. It is 200 yards south of the Fremont, Elkhorn and Missouri Valley Railroad tracks and south of a cattle pen. The mark or range used was the cupola of the court-house. This mark or range bears 15° 11′.6 west of true north. The spire of church bears 4° 05′.5 west of true north. The cupola of the schoolhouse bears 4° 44′.1 east of true north. The rod of Andrew McGinley's new windmill pump bears 82° 52′.9 east of true south.

Sioux County, Hewitt, 1900.—Observations were made over a copper nail in a cedar post 3½ feet long and 6 inches in diameter set firmly in the ground. This post was placed near the south township line and the line between blocks 14 and 15, sec. 34, T. 27, R. 57, on the lands of Christopher H. Grewell, the postmaster. It is on a slight rise about 100 feet from the corner of blocks 14 and 15, on the township line, about 100 yards south of Grewell's sod house and 300 yards southwest of the head of East Springs Creek, a tributary of Sheep Creek. Both of these streams sink in the summer season. The mark or range used was the rod of the windmill pump of Charles Newman, one-half mile distant. This mark or range bears 7° 58′.7 east of true north. A cedar reference post 225 steps distant bears 88° 20′.3 west of true north. The rocky point of Sugar Loaf Hill, about 1 mile distant, bears 3° 11′.9 east of true south.

Thomas County, Thedford, 1900.—Observations were made over a stone post 3 feet long, set 33 inches in the ground, 6 by 6 inches on top, and lettered U. S. C. & G. S., with a small hole marking the center. This stone was placed in the court-house square 87.4 feet from the southeast corner of the brick building and about 40 feet from the wire fences south and east of this stone post. The mark or range used was a distant telegraph pole. This mark or range bears 4° 52′.8 west of true south. An iron pipe 4 feet long, driven in the ground near the northern line fence of the court-house grounds, bears 0° 22′.0 west of true north. The flag pole on the cupola of the frame school building bears 88° 48′.2 west of true north. The top of the railroad water tank bears 52° 28′.9 west of true south.

Wheeler County, Bartlett, 1900.—Observations were made over a sandstone post 3 feet long, set 33 inches in the ground, 6 by 6 inches on top, and lettered U. S. C. & G. S., with a small hole marking the center. This stone was placed in the southeast corner of the court-house square. It is distant 125.6 feet from the southeast corner of the frame court-house building and is southeast of it. An iron pipe 3 feet long and 2 inches in diameter was driven in the ground 221.15 feet from this post, in a westerly direction, near a wire fence. The mark or range used was the rod of A. L. Bishop's windmill pump. This mark or range bears 15° 55′.6 west of true south. The iron pipe bears 89° 36′.1 west of true south. The central chimney of the schoolhouse on the hill bears 53° 07′.2 west of true south.

York County, York, 1900.—The station is on the grounds of the Ursuline Convent, about one-half mile east of the court-house. It is 103 feet 9 inches north of the northeast corner of the convent and hospital building and 109 feet 3 inches southwest of the northwest corner of the schoolhouse. It is marked by a sandstone lettered on top U. S. C. S. The mark or range used was the north edge of the dome on the court-house, just below the base of the statue, and bears 94° 08′.8 west of true south.

NEVADA.

Douglas County, Genoa, 1889.—The station is 43 feet south of the astronomic station, in the meridian. The astronomical station is in the vacant lot back of the store of Mr. Morris Harris, 75 feet 7 inches from the southwest corner and 83 feet 1 inch from the northwest corner. It is marked by a pier 15 inches by 25 inches, built 3 feet above the ground.

NEVADA—Continued.

Douglas County, Initial, 1894.—Initial, T, T_3, etc., are transit points in the preliminary line run in defining the California-Nevada boundary.

Esmeralda County, T_{33}, 1894.—T_{33}, T_{34}, etc., are transit points in the preliminary line run in defining the California-Nevada boundary.

Lincoln County, T_{111}, 1899.—T_{111}, T_{112}, etc., are transit points in the preliminary line run in defining the California-Nevada boundary.

Lincoln County, Pioche, 1883.—The station is 18.5 meters from the geodetic station in the line to Wheeler Peak, which bears 11° 33′.5 west of true north.

Nye County, T_{90}, 1895.—T_{90}, T_{91}, etc., are transit points in the preliminary line run in defining the California-Nevada boundary.

Ormsby County, Carson City, 1895.—The station is the north stone of a meridian line in the Pavilion yard, the property of Ormsby County, 6.45 meters south of the north fence and 1.8 meters west of the east fence. The south stone is very near the southeast corner, 44.88 meters from the north stone. Both stones are granite, 8 inches square, with intersecting grooves on top. The south stone is too far east by 0° 01′.2.

Washoe County, Verdi, 1889.—The station is 36 meters north of the longitude pier, approximately in the meridian. The pier is about ne-third of a mile east of the town, on the slight elevation back of Mr. O. Lonkey's residence, about 40 meters north of the stone fence directly opposite the water faucet in the garden. The part of the pier above ground has now been taken down.

White Pine County, Wheeler Peak, 1882.—This is the most prominent peak of the Snake Range and is locally most generally known as Jeff Davis Peak. The easiest ascent is made from Snake Valley, starting from Lehman's ranch, about 3½ miles east of the mouth of the canyon. The station is on the highest and western prong of the double peak.

White Pine County, Lehman's ranch, 1882.—The station is on the open flat, near the house and stable of B. S. Lehman, in Snake Valley. It is 33.4 meters from the southwest corner of the house, 40.5 meters from the northwest corner of the corral, and 50 meters from the northeast corner of the stable. It is marked by a rough stone about 10 inches in diameter, projecting a few inches above the ground. The southwest corner of Lehman's house bears 3° 17′.6 west of true north, and the chimney on Baker's house bears 2° 55′.4 west of true south.

White Pine County, Tres Pinos, 1882.—No description.

NEW HAMPSHIRE.

Cheshire County, Chesterfield, 1890.—Station is located on the summit of a small knoll on the Wilde place, of almanac fame. It is 1 mile east of Factoryville and a little north of the public road to Keene, N. H. Exact point is marked by the center of a lead bolt set in a solid bowlder which stands a few inches above the ground. Station is distant 4 feet 8 inches from a maple tree with a triangular cut in it and 30 feet 6 inches a little south of east of another maple tree with a similar cut in it. The center of the white spire, Park Hill, Westmoreland, bears 35° 34′.8 west of true north.

Grafton County, Hanover, 1898.—Station can be found by setting the theodolite over the north base mark of the college base on Main street, near Elm street, and laying off an angle of 129° 04′ west from the base and measuring 512.4 feet (in a northwesterly direction). The mark or range used was a stone tower in college park near the observatory, and bears 80° 09′.9 east of true south.

NEW JERSEY.

Cape May County, Cape May, 1891.—The station is located in a vacant lot northwest of the intersection of Broadway and Beach avenue. It is 100 feet north of Beach avenue and 75 feet west of Broadway.

Cape May County, Sea Isle City, 1884.—The station is on a little sand hill in the rear of the village, near the edge of the marsh.

Middlesex County, New Brunswick, 1895.—The station is located in the athletic field of Rutgers College. It is 32.4 feet from the western fence and 26 feet from the southern fence of this field, and is marked by a solid red cedar post sunk 2½ feet in the ground, its top being flush with the surface. The center of the southern chimney of William Metlar's house bears 14° 15′ east of true north.

NEW JERSEY—Continued.

Monmouth County, Sandy Hook, 1895.—The station is southwest of Sandy Hook light-house and about 100 feet from mean low-water mark on the inner shore of Sandy Hook. It is marked by a red cedar post projecting 4 inches above the sand. The flagstaff on the life-saving station bears 12° 50′ west of true north. The central rod on Sandy Hook light-house bears 51° 40′ east of true north.

NEW MEXICO.

Bernalillo County, Fort Wingate, 1899.—Observations were made over a tack in a stake projecting about 4 inches above the ground, surrounded by a pile of stones.

This stake is located on the top of a knoll almost south of the hospital building of the fort, in line with the school building to the west of south, an oak tree, and the second mountain table from the east to the east of north. It is distant in the direction of the schoolhouse 123.8 feet from the above-described oak tree and about 200 feet from the northeast corner of this school building. This stake is also in the prolonged line of the formation known as "Navaho's church" to the west of north and the northeast corner of the central and the higher part of the hospital building. The mark or range used was the northeast corner edge of the "Santa Fe Route" depot. This mark or range bears 3° 25′.1 west of true north.

Bernalillo County, Albuquerque, 1899.—Observations were made over a copper tack in a stub driven flush with the ground. This stub was located in the southern playgrounds of school No. 3, ward 3, distant 69.4 feet from the southeast corner and 74.1 feet from the southwest corner of the school building. This stub is about one-half mile northwest of the point where observations were made in 1888, which is no longer suitable for magnetic observations. The mark or range used was the intersection of the eastern side of the chimney and the roof of the house about three-fourths of a mile distant. This mark or range bears 12° 27′.4 west of true south.

Chaves County, Campbell, 1902.—Station is located southwest of the railroad section house. It is 96.4 and 82.2 feet, respectively, from the northwest and southwest corners of the section house, and is marked by a wooden stub. A windmill about 1 000 feet distant bears 80° 08′ east of true north. The mark or range used was the first milepost south of the station, and bears 71° 56′.4 west of true south.

Chaves County, Hagerman, 1902.—Station is located in the yard of Dr. F. B. Crutcher, one block east of the railroad station. It is 59.5, 55.3, and 83.5 feet, respectively, from the street to the west, the northwest corner of his house and the southwest corner of the yard. Exact point is marked by a wooden stub sunk in the ground. The chimney on the station house of the Pecos Valley Railroad bears 71° 06′ west of true south, and pole on public school bears 45° 57′ east of true north.

Chaves County, Kenna, 1902.—Station is located in the yard of ranch T_{71} of the Littlefield Cattle Company, about 1 mile northeast of the railroad station at Kenna. It is 68.6, 58.5, and 46.5 feet, respectively, from the southwest corner of the yard and southwest and southeast corners of the house and is marked by a wooden stub. The north chimney on railroad station bears 20° 17′ west of true south. The mark or range used was the railroad water-tower spire, and bears 10° 55′.9 west of true south.

Chaves County, Lower Penasco, 1902.—Station is located in the yard of the C. A. Bar ranch, about 1 mile east of the post-office. It is 88.5, 68.5, and 21.5 feet, respectively, from the northwest and southwest corners of the house and northwest corner of the storeroom, and is marked by a wooden stub. The southeast corner of the boys' sleeping house, about one-fourth of a mile distant, bears 57° 36′ west of true south.

Chaves County, Portales, 1901.—Observations were made over a cedar stub located in the open ground in front of Wise's Hotel and near Charles Woodcock's store. It is 136 and 115 feet, respectively, from the southeast and southwest corners of Woodcock's store. A tack driven in the top of the stub denotes the exact spot. The mark or range used was the spire on Seymour's house. This mark or range bears 22° 19′.8 west of true south. The spire on the schoolhouse bears 0° 42′.8 west of true south.

Chaves County, Roswell, 1901.—Observations were made at the south stone of the meridian line established in the court-house square. This stone is 119.5, 82.4, and 123.1 feet, respectively, from the southeast, southwest, and northwest corners of the court-house. The north stone is 14 feet from the north fence. These stones project about 18 inches above ground.

Colfax County, Springer, 1899.—Observations were made over a copper tack in a stake projecting about 1 inch above the ground. This stake was located in the grounds of the old court-house, the

NEW MEXICO—Continued.

county seat having been changed. It is distant 96.3 feet from the northeast corner of the stone wall surrounding the jail yard, and is 161.4 feet from the northwest corner of the court-house. It is distant 33.7 feet from the northern fence line of these old court-house grounds. It is also distant 30 feet south and 7 feet west from a tree which is in the prolonged line of the eastern wall of the jail yard. The mark or range used was the northern ridge of the adobe house. This mark or range bears 8° 59′.7 east of true south.

Eddy County, Carlsbad, 1901.—Observations were made at the south stone of a meridian line 276.8 feet long established in the court-house square. This stone is 79.1, 104.1 and 56 feet, respectively, from the southwest and southeast corners of the court house and the south fence of the grounds. The north stone is 12 feet from the north fence. From the south stone the Baptist Church spire bears 65° 02′ west of true south.

Eddy County, Hope, 1902.—Station is located in the yard of J. A. Beckett, southwest of the post-office. It is 90.6, 61.4 and 79 feet, respectively, from the southwest, northwest, and northeast corners of his house, and is marked by a wooden stub. The mark or range used was the northeast corner of the schoolhouse, and bears 33° 16′.4 west of true north. The south gable of Cox's farm house bears 35° 35′ east of true north.

Eddy County, McMillan, 1902.—Station is located west of the railroad track between the McMillan Mercantile Company's store and railroad station house. It is 31.5, 21.5, and 113.8 feet, respectively, from a corner of the fence, the nearest point of the fence, and southwest corner of the station house, and is marked by a wooden stub. The mark or range used was a telegraph pole about 500 feet distant, and bears 13° 22′.6 east of true south. The Hogg & Wilcox windmill, about 1 mile distant, bears 66° 03′ east of true north.

Eddy County, Stegman, 1902.—Station is located northwest of the post-office, near the house of Mrs. Stegman. It is 77.8, 60.3, and 50.3 feet, respectively, from the southwest corner of the house, the southwest corner of the yard, and a cottonwood tree to the south, and is marked by a wooden stub. The mark or range used was the chimney on post-office, and bears 42° 37′.5 east of true south. The north chimney on railroad station bears 32° 35′ east of true south.

Grant County, Deming, 1888.—The station is in the open field, south of Wells, Fargo & Co.'s express office and the Southern Pacific Railroad. It is 40.5 yards from the southwest corner of station agent's yard, and 55 yards from the center of the Southern Pacific Railroad track. It is marked by a redwood post sunk flush with the ground.

Lincoln County, Capitan, 1902.—The station is about a quarter of a mile southwest of the railroad station. It is 1.2 feet north of the building line on the north side of Fourth street, 29.6 feet from Hotel Meers, and 20.5 feet from Red Men's Hall. The mark or range used was the spire on the public school, and bears 52° 15′.3 east of true south. Tucson Mountain peak, about 5 miles distant, bears 17° 05′ west of true north.

Lincoln County, Carrizozo Ranch, 1902.—Station is located at the Carrizozo Ranch, about 2 miles north of the railroad station. It is 24.6, 56.8, and 55.1 feet, respectively, from the northeast corner of the storehouse and northwest and southwest corners of the mansion house of W. C. McDonald, and is marked by a wooden stub. The wall of an old house bears 72° 04′ east of true south.

Lincoln County, Lincoln, 1902.—Station is located in the court-house yard. It is 21.1 and 30.5 feet, respectively, from the east and south corners of the court-house, and is marked by a wooden post. A south meridian post was placed about 300 feet distant. A nail in a tree 22 paces from the magnetic station is directly in line between the two posts. The Catholic church spire, about one-third mile distant, bears 69° 47′ east of true south.

Lincoln County, Picacho, 1902.—Station is located near the post-office and store of R. P. Hopkins. It is 77.1 and 53.2 feet, respectively, from the southeast corner of the store and southwest corner of the stock building, and is marked by a wooden stub. The mark or range used was the chimney on August Cline's house, and bears 23° 09′.5 east of true south.

Lincoln County, White Oaks, 1902.—Station is located in the yard adjoining the Hotel Baxter. It is 13.5, 19.3, and 9.6 feet, respectively, from the southwest corner of the yard, the southwest corner of the hotel, and the street to the south, and is marked by a wooden stub. The mark or range used was the middle sash line of the gable window of L. W. Stewart's house, about one-half mile distant, and bears 55° 05′.7 east of true south.

NEW MEXICO—Continued.

Mora County, Fort Union, 1888.—The station is in the grounds at Fort Union, 87 feet and 4 inches from the center of Captain Wheeler's astronomical pier of 1874, and 96 feet from the center of the granite pier with the sundial upon it. It is marked by a stone post 2 inches by 3 inches on top, sunk flush with the surface of the ground. The center of Captain Wheeler's astronomical pier bears 66° 31′.7 west of true north.

Otero County, Alamogordo, 1902.—Station is located in the northeast corner of the court-house square. It is 133.3, 95.1, and 150.4 feet, respectively, from the southeast, northeast, and northwest corners of the court-house. Exact point is marked on a stone set in the ground for a north meridian mark. A south meridian stone was established on the south side of the court-house square. The mark or range used was the west spire of livery stable, and bears 22° 13′.5 east of true south. The spire of the Baptist Church bears 55° 23′.5 east of true north.

Otero County, Mescalero, 1902.—Station is located at the Indian agency, between the assembly building and superintendent's office. It is 71.2, 111.3, and 93 feet, respectively, from the southeast corner of the former and northeast and northwest corners of the latter. Exact point is marked on a stone set in the ground for a north meridian mark. A south meridian stone was established beyond the superintendent's office.

Otero County, Tularosa, 1902.—Station is located on the lot adjoining Sanders Hotel, near the corner of Main and D streets. It is 3.1, 33.5, and 89.3 feet, respectively, from the southeast corner of the hotel, Main street, and D street, and is marked by a wooden stub. The mark or range used was the northwest corner of the house of Jose Gomez, and bears 69° 40′.7 east of true south. The corner of Knight's store bears 60° 48′ east of true north.

Otero County, Upper Penasco, 1902.—Station is located in the open lot adjoining the store of J. E. C. Bell. It is 61.4, 118.9, and 132.6 feet, respectively, from northwest corner of Al Cole's house and southwest and southeast corners of the store, and is marked by a wooden stub. The mark or range used was the schoolhouse chimney, and bears 45° 03′ west of true south. The southwest corner of Mayhill's house bears 56° 04′ east of true north.

Rio Arriba County, Lumberton, 1899.—Observations were made over a copper tack in a small stake projecting 3 inches out of the ground. This stake was placed in the open space east of the inclosed field of Antonio Lovato. It is in line with the house of Petro Flores west of south of this station, and the house of Gulio Deharra east of north of this station. This stake is distant 96.1 feet from the east and the near fence line of the Lovato property. It is 170.9 feet to the northeast corner of this property, measured along this fence from the point nearest the station, and it is 196.1 feet from this northeast corner to the station in a direct line. The station is distant 300 and 344.2 feet, respectively, from the nearest corners of Mr. Gulio Deharra's and from Mrs. Frassisco's houses. The mark or range used was the northern ridge of the residence of Gavino Pacheco. This mark or range bears 47° 50′.4 west of true south.

Santa Fe County, Santa Fe, 1899.—Observations were made over a copper tack in a stub driven flush with the ground. This stub was located in the parade grounds of old Fort Marcy, distant 74.2 feet from the center of the astronomical pier, at the flag pole of the fort, and is also distant 177.5 feet from the astronomical longitude pier, which is located in these parade grounds. This stub was placed in line with the flagstaff on the land-office building and the lamp-post on these grounds. This point is about 150 or 160 feet east of the point where magnetic observations were made in 1895. The mark or range used was the tip of the dome of the new capitol building. This mark or range bears 22° 16′.2 west of true south.

San Miguel County, East Las Vegas, 1899.—Observations were made over a copper tack in a stake driven flush with the ground. This stake was located in Lincoln Park, in East Las Vegas, and east of the river. It is distant 46 feet southeast of the center of one of the diagonal pathways through this park, and is 48.1 feet southwest of the center of the other diagonal pathway. Lincoln Park is bounded by Lincoln street, Jackson street, Seventh street, and Eighth street. This stake is in the line of the eastern wall of Mr. Buck's stone house to the south (the third house from Eighth street) and the flag pole on Lincoln avenue to the north, and also in line with the chimney of an old mill on Seventh street to the east and Mr. McMurphy's residence to the west (the second house from Jackson street). There is a tree between this stake and the eastern wall of Mr. Buck's house, which is in line with the

NEW MEXICO—Continued.

flag pole on Lincoln avenue. The mark or range used was the gable of a house. This mark or range bears 25° 06′.2 east of true south.

Socorro County, Fort Craig, 1899.—Observations were made over a copper tack in a stake driven flush with the ground. This stake was located in the old drill ground at Fort Craig. It is distant 25.7 feet east and 17.8 feet south of the center of the stone pier over which magnetic observations were made in 1888. It is also distant 29.6 feet in a straight line from the center of this stone pier. The mark or range used was a distant mountain peak. This mark or range bears 20° 04′.2 west of true south.

Socorro County, Socorro, 1899.—Observations were made over a copper tack in a stake driven flush with the ground. This stake was located in the court-house grounds, distant 15.1 feet from the inner side of the stone-wall fence to the south and 71.3 feet from the inner side of the stone-wall fence to the west of it. It is also distant 108.7 feet from the southwest corner of the court-house building. The mark or range was the western intersection of the roof and chimney of a mill. This mark or range bears 34° 26′.9 east of true south.

Taos County, Tres Piedras, 1899.—Observations were made over a copper tack in a small stake projecting 2 inches out of the ground. This stake was placed in the open space east of the railway station of the Denver and Rio Grande Railway, in line with the northern side of this railway station, and is distant 302.3 feet from its northeast corner. It is approximately in the line of a small, stunted evergreen 300 feet north of the station and the western edge of the summit of range between mountains in the distance and "Las Tres Orejas." The mark or range used was the middle one of these three peaks, known collectively as "Las Tres Orejas," or "the three ears." This mark or range bears 28° 14′.4 east of true south.

Union County, Clayton, 1899.—Observations were made over a copper tack in a stake driven flush with the ground. This stake was located in the boys' playground of the public school, distant 67.2 feet from the southeast corner of the school building, 96.6 feet from the southwest corner of the school building, and 47.7 feet from the northeast corner of a brick outhouse on the boys' side. It is also distant about 40 feet north of the prolongation of the fence line, and is about 85 feet east of the fence line dividing the school grounds. This stake is about in line with the tower on the school building and the adobe house on the claim of Thomas Solomon to the east of south, and is also about in line with the easternmost part to the north and the beginning of the curve of the Colorado Southern Railway to the south. The mark or range used was the southwest corner of the adobe building on the claim of Thomas Solomon. This mark or range bears 45° 11′.5 east of true south.

Valencia County, Grant, 1899.—Observations were made over a copper tack in a stake projecting about 3 inches above the ground. This stake was located on ground north of the railroad track, between the railway section house and the Santa Fe Pacific Railway station. It is distant 126.6 feet from the northwest corner of the section house, 290 feet from the northwest corner of the freight house, and about 235 feet north of the center of the track. The mark or range used was the edge of a mountain. This mark or range bears 19° 08′.9 east of true south.

NEW YORK.

Albany County, Albany, 1896.—Station is marked by a cross cut in the top of a marble post, 24 inches by 4 inches by 4 inches. This post is sunk flush with the surface of the ground, and is located on the hill north of the city, near the old Dudley Observatory, about 200 feet southwest of the main observatory building.

Broom County, Binghamton, 1888.—A meridian line was established on the hill south of the city, and marked by two stone posts about 350 feet apart, one at the corner of McKinney and Gertrude streets, the other at the corner of McKinney and Hotchkiss streets. Magnetic observations were made over the south stone. The mark or range used was the spire of the Congregational church, which bears 4° 30′ east of true north.

Chenango County, Oxford, 1885.—Observations were made over the lead bolt in a stone sunk flush with the level of the ground, on the crest of the small hill back of Oscar Dodge's house and barn, on Scott street, at the end of Taylor street. The mark or range used was the pinnacle of the Academy building, and bears 25° 50′.3 east of true south. The Universalist church bears 83° 27′.3 east of true south

NEW YORK—Continued.

Erie County, Buffalo, 1885.—The station is located in the rear of the quartermaster's department of Fort Porter. It is 179 feet from the Lake Survey Geodetic station (marked by pier), and distant 68 feet 6 inches and 70 feet 2 inches, respectively, from the west and north corners of the stone house used for stores.

Jefferson County, Mannsville, 1884.—The magnetic station was located on the line of geodetic station, Mannsville–Loomis, about 50 meters distant from the former. The geodetic station is about one-half mile northeast of the village, on land owned by Mr. W. G. Marsh, lot 117, Ellisburg Township, on the highest land in the immediate vicinity. It is marked by a marble post set 18 inches below the surface of the ground. Two reference stones are set close to a stone wall east of the station, distant, respectively, 91.79 meters, and 107.84 meters.

Madison County, Fenner, 1882.—The station is located in the line from Fenner geodetic station to Tassel geodetic station, distant 160 feet from the former. Fenner geodetic station was established by the New York State survey, and is marked by a granite post lettered on top U. S. C. S. Four other posts (marble) are set distant 1.5 meters from this post, at the four cardinal points. It is in Fenner Township, on land of Orville E. Wormuth.

New York County, Riverside Park, 1885.—The station is located just north of the Claremount Hotel, at One hundred and twenty-sixth street and Riverside drive, New York City. It is distant 74 feet 3 inches almost due north from the center of the stone marking the extension of One hundred and twenty-sixth street.

Oneida County, Pen Mount, 1882.—Magnetic station is 18.8 meters from geodetic station in line to "Star Hill." Pen Mount is the highest of the "Steuben Hills," in the northwestern part of the county. The geodetic station is on the top of this hill in a cleared field belonging to Mr. O. D. Jones, and marked by 5 limestone posts each 3 feet long. The center post, lettered U. S. C. S., is the station.

Onondaga County, Howlett, 1883.—The station is located in the large open lot north of the geodetic station and due west of the astronomical station. The geodetic station is in the township of Marcellus, close to the road running north and south, which forms the boundary between the townships of Marcellus and Onondaga. It is at the southern edge of Mr. O. W. Fyler's barnyard, just opposite Mr. J. H. Secor's property. It is marked by a stone post with 4 other posts 1½ meters north, south, east and west, respectively, from it. It is lettered on top U. S. C. S., and on its side N. Y. S. S. 109.

Oswego County, Loomis, 1882.—The station is located approximately in line joining Loomis geodetic station to Florence geodetic station, and is distant 25 feet from the former. The geodetic station is near the village of Palermo, about 1.3 kilometers south-southwest from Palermo Center. It is on land owned by Mr. Loomis, who lives at the corner of the road leading to Fulton from Palermo Center. It is marked by a marble post 30 inches long, sunk flush with the surface of the ground and lettered on top U. S. C. S., with two grooves cut in the diagonals. Four other posts are set distant 1.5 meters from the central one, one in each cardinal direction.

Otsego County, Otsego, 1882.—Magnetic station is 29 feet from Otsego geodetic station and in line to "Summit." The geodetic station is located upon "East Hill," about 3 miles east of Cherry Valley and about 4 miles from Sharon Springs railroad station. The station is on land owned by Mr. Albert Stiles, and is marked by a central post with four others true north, south, east, and west of it.

Tompkins County, Ithaca, 1890.—The station is located on the knoll just in the rear of Professor Fuerte's and Professor Thurston's houses. The point is marked by a marble post 2½ feet by 4 inches by 4 inches, buried so as to be flush with the surface of the ground. This post is lettered on top U. S. C. S. The spire on the University Chapel bears 78° 27′ west of true north.

Warren County, Prospect (near Caldwell), 1882.—The station is 849 feet below the geodetic station on a hill in the rear of a red barn. The geodetic station is about 3 miles west of Lake George post-office and about 1½ miles west of the Mountain House, on the summit of the mountain, and is marked by a copper bolt placed in the solid rock 2.3 feet below the surface of the ground.

Wayne County, Clyde, 1883.—The station is located in the open field south and west of the geodetic station, distant 176.5 feet. The geodetic station is situated in lot 73, Galen Township, about 2 miles south of the village of Clyde, on a high narrow ridge running approximately north and south. It is marked by a stone post set 2½ feet below the surface of the ground, and is 5.43 meters south of a large basswood tree, the only tree on the hill.

NORTH CAROLINA.

Alamance County, Graham, 1899.—Observations were made over the monument in the southwest corner of the court-house square. The other monument is true north of this monument, near the northwestern boundary of the court-house property.

Alexander County, Taylorsville, 1900.—Observations were made over the monument marking the south end of the meridian line established in the court-house square. It is southeast of the court-house. The other monument is in the northeast corner of the court-house square.

Alleghany County, Sparta.—A meridian line was established on the court-house property. Observations were made over the north monument in the northeast corner of the court-house square, in the rear of the court-house. The south monument is near the southern boundary of the court-house property.

Anson County, Wadesboro, 1900.—In the field occupied by the Smithsonian eclipse expedition in May, 1900, a meridian line was established and permanently marked by two marble blocks, 9 by 9 inches square and 2 feet long. The magnetic observations were made by G. R. Putnam at a point 91 yards east of the line, the meridian line having been established later.

Ashe County, Jefferson, 1900.—Observations were made over the north monument of the meridian line, in front of the court-house. The south monument is in front of the jail.

Beaufort County, Washington, 1898.—Observations were made over the monument in the city cemetery, near its southern inclosure. The other monument is true north of this monument, near the western entrance of the cemetery.

Bertie County, Windsor, 1898.—Observations were made over the north monument at the "County Home," 2 miles southeast of Windsor, near the superintendent's house. The other monument is true south of this monument and near the fence.

Bladen County, Elizabethtown, 1899.—Observations were made over the monument in the southeast corner of the court-house square. The other monument is true north of this monument, near the court-house building.

Brunswick County, Southport, 1898.—Observations were made over the monument in the northeast corner of the ground of Fort Johnson. The other monument is true south of this monument, near the river bank.

Buncombe County, Asheville, 1898.—Observations were made over the monument in the "Asheville Cemetery" in front of the William J. Johnson section. The other monument is true north of this monument, near the entrance of the cemetery.

Burke County, Morganton, 1900.—Observations were made over the south monument of the meridian line, in the southwest corner of the court-house square. The north monument is near the northern edge of the square.

Cabarrus County, Concord, 1899.—Observations were made over the monument in the open square in the rear of the court-house. The other monument is true south of this monument, in the court-house square.

Caldwell County, Lenoir, 1900.—Observations were made over the north monument of the meridian line on the grounds of "the Davenport College," in the open space near the entrance gate. The south monument is also in the college grounds, in the grove on the side of the hill.

Camden County, Camden, 1900.—Observations were made over the south monument of meridian line, near the southern limit of the court-house square. The north monument is near the northern limit of the square.

Carteret County, Beaufort, 1898.—A true north and south line, marked with two monuments, was established in the court-house square. A surveyor should mount his compass over the south monument.

Caswell County, Yanceyville, 1900.—Observations were made over the south monument of the meridian line, on the court-house property, just in front of the Corbett Hotel. The north monument is also on the court-house property, on the hill.

Catawba County, Newton, 1900.—Observations were made over the south monument of the meridian line, east of the court-house. The north monument is also on the court-house property, northeast of the court-house.

Chatham County, Pittsboro, 1899.—Observations were made over the monument in the southeast

NORTH CAROLINA—Continued.

corner of the court-house square. The other monument is true north of this monument, on the court-house property.

Cherokee County, Murphy, 1898.—Observations were made over the monument on the open lot east of the high school. The other monument is true south of this monument, on the edge of the hill, and also on county property.

Chowan County, Edenton, 1898.—Observations were made over the monument in the southeast corner of the court-house square. The other monument is also in the court-house square, true north of this monument.

Clay County, Hayesville, 1900.—Observations were made over the south monument of the meridian line, in front of the court-house. The north monument is near the northern boundary of the court-house square.

Cleveland County, Shelby, 1899.—Observations were made over the monument in the court-house square, southeast of the building. The other monument is true north of this monument, in the court-house square.

Columbus County, Fair Bluff, 1891.—The station is in the open space just one block south of the Atlantic Coast Line Railroad, between the properties of Col. T. F. Toms and Mr. J. A. Mearsand, near the center of the street. It is marked by a copper tack in a yellow-pine post.

Columbus County, Lake Waccamaw, 1891.—The station is in the yard of Mr. G. S. Gillespie, in the northern suburb of village. It is 62.5 feet from the southwest corner of Mr. Gillespie's house, and is 12 feet from the west fence and 74.3 feet from the north fence of the yard. The station is marked by a copper tack in a yellow-pine post.

Columbus County, Whiteville, 1899.—Observations were made over the monument in the northwest corner of the court-house lot. The other monument is true south of this monument, near the southern boundary of the court-house property.

Craven County, Newbern, 1898.—Observations were made over the monument in the extreme northern part of Cedar Grove Cemetery. The other monument is true north of this monument, in a grove of pines.

Cumberland County, Fayetteville, 1899.—Observations were made over the monument in the lot owned by the city, near the old court-house square, in front of Mr. Underwood's house. The other monument is true north of this monument, in the old court-house square.

Currituck County, Currituck, 1898.—Observations were made over the monument in the southeast corner of the court-house square. The other monument is true north of this monument, and also in the court-house square.

Currituck County, Knott Island, 1887.—The station is on the Virginia and North Carolina boundary on Knott Island, about 1,700 feet from Back Bay, a little north of Mr. Williams's stable, and 52 feet east of the latitude station of the Virginia and North Carolina boundary line.

Currituck County, Northwest, 1887.—The station is on the Virginia and North Carolina boundary, 10 miles east of where the State line crosses the Dismal Swamp Canal.

Dare County, Cape Hatteras Light-House, 1898.—No monuments marking the true north and south line were established here. The station was marked by a stub and tack 50 yards from the inner beach, on a point of land southeast of the house owned by Dr. J. J. Davis.

Dare County, Chicamicomico, 1898.—No monuments marking the true north and south line were established here. The station was marked by a stub and tack 30 yards from the inner beach, and east of the house owned by Aaron O'Neal.

Dare County, Manteo, 1898.—Observations were made over the monument in the southwest corner of the court-house square. The other monument is true north of this monument, near the fence.

Davidson County, Lexington, 1900.—Observations were made over the north monument of the meridian line, in the court-house square, in the small plot in front of the post-office. The south monument is near the southern limit of the court-house square.

Davie County, Mocksville, 1900.—Observations were made over the south monument of the meridian line, in the southwest corner of the court-house property. The north monument is in the northwest corner of the property.

NORTH CAROLINA—Continued.

Duplin County, Kenansville, 1899.—Observations were made over the monument in the large open square (the property of Duplin County) west of the court-house. The other monument is true north of this monument, and also in this square.

Duplin County, Warsaw, 1891.—The station is in the open lot adjoining the Methodist church in the southeastern suburbs of the village. It is marked by a copper tack in a yellow-pine post. The point is distant 30.3 meters from the southwest corner of the Methodist church and 15.13 meters from the southwest corner of the ditch, in the rear of the church.

Durham County, Durham, 1898.—At the County Home, 3 miles from the city of Durham, observations were made over the monument just in front of the superintendent's house. The other monument is true south of this monument, near the public road.

Edgecombe County, Rocky Mount, 1900.—The station is about one-half or three-fourths of a mile west of the town, on "Tem" Short's farm. It is 14.55 feet from the northwest corner and 17.80 feet from the southwest corner of his new tobacco barn.

Edgecombe County, Tarboro, 1899.—Observations were made over the monument in "the city common" in front of the high school. The other monument is true north of this monument in "the common."

Forsyth County, Winston-Salem, 1899.—Observations were made over the monument near the southern boundary fence of the Moravian cemetery. The other monument is also in the cemetery, true north of this monument. The monuments at this place are rough granite posts, with a small hole marking the center.

Franklin County, Louisburg, 1899.—Observations were made over the monument in the county lot in the rear of the jail. The other monument is true south of this monument, in the same county lot, near the river.

Gaston County, Dallas, 1900.—Observations were made over the south monument of the meridian line in the southeast corner of the court-house square. The north monument is in the northeast corner of the square.

Gates County, Gatesville, 1899.—Observations were made over the monument in the southwest corner of the court-house lot. The other monument is true north of this monument, in the court-house lot.

Graham County, Robbinsville, 1900.—Observations were made over the north monument of the meridian line on the court-house property, in front of the court-house.

Granville County, Oxford, 1898.—Observations were made over the monument in the grounds of the Orphan Asylum. The other meridian stone is also in the Orphan Asylum grounds, and true north of this monument.

Green County, Snow Hill, 1899.—Observations were made over the bluff on the side of the road which runs in front of the court-house. The other monument is true south of this monument, near the court-house building.

Guilford County, Greensboro, 1899.—Observations were made over the monument in the park in front of the Greensboro Female College. The other monument is true north of this monument, near the street.

Halifax County, Halifax, 1899.—Observations were made over the monument in the court-house lot, northeast of the building. The other monument is true south of this monument, near the eastern fence of the court-house square.

Halifax County, Weldon, 1887.—The station is in the lot west of the Methodist church. It is 15 paces from Mrs. Allen's fence, and northwest of it.

Harnett County, Lillington, 1899.—Observations were made over the monument in the southeast corner of the court-house square. The other monument is true north of this monument, in the court-house square.

Haywood County, Waynesville, 1900.—Observations were made over the north monument of the meridian line in the rear of the court-house.

Henderson County, Hendersonville, 1900.—Observations were made over the north monument of the meridian line, in the open space in the yard in the rear of the court-house. The south monument is in the same yard.

NORTH CAROLINA—Continued.

Hertford County, Riddicksville, 1887.—The station is 1 mile south of the Nottaway River, on the lawn in front of the house of Mr. James D. Riddick.

Hertford County, Winton, 1899.—Observations were made over the monument near the southern edge of the court-house lot. The other monument is true north of this monument, in the court-house lot, near the fence.

Hyde County, Swanquarter, 1898.—Observations were made over the monument in southwest corner of the court-house square. The other monument is true north of this monument, near the court-house building.

Iredell County, Statesville, 1899.—Observations were made over the monument in the grounds of the Statesville graded school. The other monument is true north of this monument, near the street. The monuments at this place are of marble instead of granite.

Jackson County, Webster, 1898.—Observations were made over the monument on the edge of the public road which runs in front of the court-house. The other monument is true north of this monument, near the court-house building.

Johnston County, Smithfield, 1899.—Observations were made over the monument in the southeast corner of the court-house square. The other monument is true north of this monument, near the edge of the street.

Jones County, Trenton, 1900.—Observations were made over the south monument of the meridian line in the court-house square.

Lenoir County, Kinston, 1899.—Observations were made over the monument in the northeast corner of the court-house lot. The other monument is true south of this monument, near the street.

Lincoln County, Lincolnton, 1899.—Observations were made over the monument in the open court-house square. The other monument is true south of this monument, near the court-house building.

McDowell County, Marion, 1898.—Observations were made over the monument in the northeast corner of the court-house square. The other monument is true south of this monument, near the edge of the court-house square.

Macon County, Franklin, 1898.—Observations were made over the monument in the northeast corner of the court-house square. The other monument is true south of this monument, in the open space near the jail.

Madison County, Marshall, 1898.—Observations were made over the monument on the south side of the hill above the court-house. The other monument is true south of this monument, near the jail fence.

Martin County, Jamesville, 1891.—The station is in the open lot adjoining the "White Methodist church," in the southeastern suburbs of the town. The station is marked with a yellow-pine post and copper tack. The station is distant 28.3 meters from the northeast corner of the Methodist church and 32.5 meters from the southeast corner of this church.

Martin County, Williamston, 1899.—Observations were made over the monument in the rear of the court-house. The other monument is true north of this monument, near the boundary fence of the court-house yard.

Mecklenburg County, Charlotte, 1899.—Observations were made over the monument in the large open lot in the rear of the "Charlotte graded school." This lot is the property of the school. The other monument is on this same lot true north of this monument.

Mitchell County, Bakersville, 1900.—Observations were made over the north monument of the meridian line in the open space on the court-house property northwest of the court-house. The south monument is across the street, near the sidewalk.

Mitchell County, Roan High Bluff, 1895.—The station is at Roan High Bluff triangulation station. It is on a very high bluff three-fourths mile from "Cloudland Hotel," near the State line in Mitchell County. It is on a very large rock on the edge of High Bluff. Roan High Knob is the highest point in the vicinity.

Montgomery County, Troy, 1899.—Observations were made over the monument in the northeast corner of the court-house lot. The other monument is true south of this monument, near the southern boundary of the court-house lot.

NORTH CAROLINA—Continued.

Moore County, Carthage, 1899.—Observations were made over the monument southwest of the court-house building. The other monument is true north of this monument, on the court-house property.

Nash County, Nashville, 1899.—Observations were made over the monument in the court-house lot near its northern boundary. The other monument is true south of this monument, in the court-house lot.

New Hanover County, Wilmington, 1898.—Observations were made over the monument in the grounds of "the city hospital." The other monument is true north of this monument, near the northern inclosure of the grounds.

Northampton County, Jackson, 1899.—Observations were made over the monument in the court-house lot, northwest of the building. The other monument is true south of this monument, in the court-house lot, near the fence.

Onslow County, Jacksonville, 1898.—Observations were made over the monument in the southeast corner of the court-house square. The other monument is near the jail and is true north of this monument.

Orange County, Chapel Hill, 1898.—On the campus of the University of North Carolina; observations were made over the monument just east of the building used by the State geological survey. The other monument is also on the campus, near the Episcopal church, and is true north of this monument.

Orange County, Hillsboro, 1898.—Observations were made over monument on edge of the public road east of the town. The other monument is also on the edge of the public road and is true north of this monument.

Pamlico County, Bayboro, 1898.—Observations were made over the monument in the northeast corner of the court-house square. The other monument is true north of this monument, near the northern edge of the court-house square.

Pasquotank County, Elizabeth City, 1898.—Observations were made over the monument at the "county home," west of the building. The other monument is near the fence and is true south of this monument.

Pender County, Burgaw, 1899.—Observations were made over the monument southeast of the court-house building. The other monument is also in the court-house lot, true north of this monument.

Perquimans County, Hertford, 1899.—Observations were made over the monument in the broad avenue of "the city cemetery." The other monument is true north of this monument, near the gate of the cemetery.

Person County, Roxboro, 1898.—Observations were made over the monument in the city cemetery 1½ miles from the town. The other monument is also in the city cemetery and true north of this monument.

Pitt County, Greenville, 1898.—Observations were made over the monument in the open space just north of the Methodist cemetery. The other monument is true north of this monument, in edge of the city cemetery.

Polk County, Columbus, 1900.—Observations were made over the north monument of the meridian line east of the court-house. The south monument is also on court-house property south of the court-house.

Randolph County, Ashboro, 1899.—Observations were made over the monument in the southwest corner of the court-house square. The other monument is true north of this monument, near the northern boundary of the court-house square.

Richmond County, Rockingham, 1899.—Observations were made over the monument in the grounds of "the graded school." The other monument is true north of this monument, in the grounds of the school near the street.

Robeson County, Lumberton, 1899.—Observations were made over the monument in the northeast corner of the court-house square. The other monument is true south of this monument, near the southern boundary of the court-house square.

Rockingham County, Wentworth, 1899.—Observations were made over the monument in the

NORTH CAROLINA—Continued.

southeast corner of the court-house square. The other monument is true north of this monument, near the jail fence.

Rowan County, Salisbury, 1898.—Observations were made over the monument near the center of the city cemetery. The other monument is true south of this monument, near the southern gate.

Rutherford County, Rutherfordton, 1899.—Observations were made over the monument in the open lot in the rear of the court-house, near the southern boundary of the court-house property. The other monument is true south of this monument, on the court-house property.

Sampson County, Clinton, 1899.—Observations were made over the monument in the open space in front of the city cemetery. The other monument is true north of this monument, on the edge of the road.

Scotland County, Laurinburg, 1899.—Observations were made over the monument in the northern edge of the ground of the Presbyterian church. The other monument is true south of this monument, near the public road.

Stanly County, Albemarle, 1900.—Observations were made over the south monument of the meridian line, near the southern boundary of the grounds of the graded school in the northeast section of the city. The north monument is east of the schoolhouse.

Stokes County, Danbury, 1900.—Observations were made over the north monument of the meridian line, in the court-house square and east of the court-house. The south monument is also on court-house property, just across the public road.

Surry County, Mount Airy, 1899.—Observations were made over the monument in the front yard of the residence of Thomas Woodroffe, of the Mount Airy granite quarry. The other monument is true south of this monument, in the same yard.

Swain County, Bryson City, 1898.—Observations were made over the monument on top of the hill in the city cemetery, near the Collins section. The other monument is true north of this monument, near crest of the hill.

Transylvania County, Brevard, 1898.—Observations were made over the monument in the south east corner of the court-house square. The other monument is true north of this monument, in the court-house square.

Tyrrell County, Columbia, 1899.—Observations were made over the monument in "the academy" grounds east of the town. The other monument is true south of this monument, near the southeast corner of the academy grounds.

Union County, Monroe, 1899.—Observations were made over the monument in the northeast corner of the court-house square. The other monument is true south of this monument, also in the court-house lot.

Vance County, Henderson, 1899.—Observations were made over the monument in the northern corner of the court-house square. The other monument is true south of this monument, near the boundary fence of the court-house property.

Wake County, Raleigh, 1899.—Observations were made over the monument in the open park in front of the "A. M. College." The other monument is also in this park true north of this monument, near a small summer house.

Warren County, Warrenton, 1898.—Observations were made over the monument in the new city cemetery. The other monument is also in the city cemetery true north of this monument.

Washington County, Plymouth, 1898.—Observations were made over the monument in the paddock adjoining the house of W. H. Stubbs, on the edge of the road. The other monument is also on the edge of the road true south of this monument.

Watauga County, Boone, 1900.—Observations were made over the north monument of the meridian line, east of the court-house. The south monument is also on county property across the road near the sidewalk.

Wayne County, Goldsboro, 1899.—Observations were made over the monument in the southeast corner of the court-house square. The other monument is true north of this monument, near the register's office.

NORTH CAROLINA—Continued.

Wilkes County, Poore, 1895.—The station is at Poore triangulation station, which is on the summit of Poors Knob, Brushy Mountain, near the county line of Alexander County, N. C.

Wilkes County, Wilkesboro, 1899.—Observations were made over the monument in the northwest corner of the court-house property. The other monument is true south of this monument at the corner of the street.

Wilson County, Wilson, 1899.—Observations were made over the monument in the grounds of the graded school, in the eastern section of the city. The other monument is true south of this moument in the school lot, near the edge of the street.

Yadkin County, Yadkinville, 1900.—Observations were made over the north monument of the meridian line in the northeast corner of the court-house square. The south monument is in the southeast corner of the square.

Yancey County, Burnsville, 1900.—Observations were made over the south monument of the meridian line, in the southwest corner of the court-house square. The north monument is in the northwest corner of the square.

NORTH DAKOTA.

Burleigh County, Bismarck, 1890.—The station is in the court-house grounds and is identical with the latitude station, 120.5 feet south of the longitude pier.

Pierce County, Rugby, 1896.—Observations were made over the center of an oak post. This oak post was located about 1 000 feet south of the railway station, in a large open field, and about 30 feet west of the main street extended. It is also distant 501 feet southeast of the Rugby 2-story wooden school building. The point used as a mark or range bears 25° 06′.2 east of true south.

Pembina County, Pembina, 1896.—Observations were made over the center of a cottonwod post. This post was located 700 feet south of the junction of the Pembina River and the Red River of the North. It is distant 510 feet from the bank of the Red River of the North, 575 feet east of the county road, and about 800 feet southeast of the wooden bridge across the Pembina River. Fort Pembina is about three-fourths of a mile south of this magnetic station. The mark or range used was the flag pole at Fort Pembina. This mark or range bears 8° 12′.1 east of true south. The bridge across the Pembina River bears 37° 07′.9 west of true south. The central point on the Winchester Hotel bears 50° 22′.9 west of true south. The central point of the St. Vincent water tank of the Great Northern Railway bears 64° 47′.9 east of true north.

Stark County, Dickinson, 1896.—Observations were made over the center of a pine stub. This pine stub was located in the large open space south of the Dickinson High School building of 1891, 128.5 feet distant from the south face of this building. It is also distant 153.2 feet west of the north and south street running in front of this school building. The mark or range used was the Catholic church spire. This mark or range bears 87° 04′.6 east of true north. The central point on the court-house bears 85° 15′.4 east of true south. The central point on the high school bears 2° 31′.4 west of true north.

Stutsman County, Jamestown, 1896.—Observations were made over a point located in the large open space on the west side of the North Side public school, 117.8 feet northwest of the northwest corner of the plank fence which surrounds this school building, 233.3 feet from the school building, 349.3 feet north of Fifth street, and 82 feet east of Third avenue extended. The North Side public school building is in the north side of the town, between Second and Third avenues, and on the north side of Fifth street. It is a 2-story brick building. The point used as a mark or range bears 11° 03′.8 east of true south. The flag pole on the court-house bears 1° 40′.2 west of true south. The flag pole on the South Side schoolhouse bears 6° 13′.2 west of true south.

Williams County, Williston, 1896.—Observations were made over the center of an ash post. This post was located in the northwest corner of the Williston public school grounds, in the north side of the town and east side of the main street. It is distant 57 feet east of the plank fence on the west side of the school grounds, 56.9 feet south of the plank fence on the north side of the school grounds, and 148.2 feet northwest of the public school building. The point used as a mark or range bears 82° 43′.1 east of true south.

OHIO.

Ashland County, Ashland, 1900.—Observations were made over a small marble block 3 feet 2 inches long, 6 inches square on top, and lettered U. S. C. &. G. S. A cross in the center of this stone marks the point. This marble block is located in the grounds of the county infirmary, about 5 miles south of Ashland. It is placed in the pasture immediately west of the infirmary building and in the southwest corner of it. It is distant 126 feet from the west fence and 71.5 feet from the south fence of this pasture field. The mark or range used was the western edge of the west chimney on the house nearly south of the station. This mark or range bears 7° 59′.1 east of true south. The south edge of the south chimney on the infirmary bears 79° 04′.8 east of true north.

Ashtabula County, Jefferson, 1900.—Observations were made over a block of sandstone 3 feet 2 inches long, 6.2 by 6.6 inches on top, lettered U. S. C. & G. S. A cross in the center of this stone marks the point. It is located in the southwest corner of the high-school grounds, 96 feet north of the board walk at the south edge of the grounds and 46.5 feet from the edge of the road west of the grounds. A similar block of sandstone was placed 403.8 feet true north of this stone, 45.5 feet from the edge of the road west of the grounds, and 167.8 feet from the edge of the board walk at the north side of the grounds. The mark or range used was the west edge of a chimney. This mark or range bears 29° 48′.4 east of true south.

Athens County, Athens, 1898.—A new meridian line 316 feet long was established in the grounds of the Ohio University. It was marked by two sandstone posts with copper station marks. The south stone is near the southwest corner of the grounds. A magnetic station was marked by a similar post 233.1 feet from the south stone, 183.3 feet from the south stone of a former meridian line, and 93.6 feet from Mulberry street. The mark or range used was the flag pole on the insane asylum, and bears 54° 53′.3 west of true south.

Cuyahoga County, Cleveland, 1900.—Observations were made over the north meridian stone of the meridian line in the marine-hospital grounds at a point 180.98 feet north of the astronomical station. This meridian stone is composed of a block of sandstone 14 by 14 inches square, with a copper bolt marking the center. It is 56.96 feet south and 237.94 feet west of the center of the dome of the marine hospital. Observations were made over this same point in 1880, 1888, and in 1893. The mark or range used was the south meridian stone in the marine-hospital grounds.

Fayette County, Washington, 1900.—Observations were made over the south meridian stone of the county official meridian established by Mr. Wm. M. Davis in 1869. It is located in the grounds of the county infirmary, about 2½ miles east of the court-house. This stone is 8 by 8 inches on top and extends 14 inches above the surface of the ground. The north meridian mark is a large stone, also located in the grounds of the county infirmary. The mark or range used was the north meridian stone of the county meridian. This mark or range bears 0° 01′.9 west of true north.

Franklin County, Columbus, 1900.—Observations were made over the station established in the campus of the Ohio State University and marked with a stone post in 1891. Its exact location is well known to the university authorities. The mark or range used was the tip of a house east of south of this stone post. This mark or range bears 25° 25′.2 east of true south.

Hamilton County, Cincinnati, 1899.—The station is at Mount Lookout, somewhat northeast of the observatory, on land owned by Mr. J. Kilgore. It is in the field 247 feet from the east fence and 47 feet from the south fence.

Licking County, Newark, 1900.—Observations were made over a copper tack in a wooden stub flush with the ground, located on the property of Mr. E. Everetts, owner of the glass works. This property has been subdivided into lots. This stub is distant 62, 117.6, and 151.6 feet, respectively, from the northwest corner of Henry Rolf's property, from the northwest corner of his house, and from the northeast corner of his property at the edge of Beech street. It is also distant 138.7 and 164 feet from the western edge of Beech street and from the center of it, and is about 900 feet east of the Baltimore and Ohio Railroad, Erie division. The mark or range used was the spire of the Second Presbyterian church. This mark or range bears 11° 16′.9 west of true south.

Logan County, Bellefontaine, 1900.—Observations were made over a block of Georgia marble 3 feet long, 8¼ by 8⅜ inches on top, and lettered U. S. C. & G. S., with a cross which marks the point. This block rests on another block of Georgia marble and extends 8 inches above the surface of the ground. It is located on the crest of the small knob, said to be the highest point in the State

OHIO—Continued.

of Ohio, about 1½ miles east of the court-house. It is distant 122½ feet from the larger of two trees on this hill and 124 feet from the fence east of it. The county surveyor, Mr. W. A. Grim, set another stone marking the true meridian line on the crest of the opposite hill to the north and nearer the road. The mark or range used was the flagstaff on the court-house. This mark or range bears 72° 25′.9 west of true south.

Marion County, Marion, 1900.—Observations were made over a block of sandstone 3 feet long, 6 inches square on top, and lettered U. S. C. & G. S., with a cross in the center of it which marks the point. This block is placed in the grounds of the county infirmary, about 2 miles east of the court-house, in a small pasture immediately south of the infirmary. It is distant 53.8 feet from the south fence and 59.8 feet from the east fence of this field. The mark or range used was the northwest edge of a house about a mile to the southeast. This mark or range bears 50° 29′.6 east of true south. The southwest edge of a barn to the southwest bears 21° 03′.2 west of true south. The southeast edge of the southeast chimney on the infirmary bears 1° 56′.9 east of true north.

Montgomery County, Dayton, 1900.—Observations were made over a copper tack in a stub 1 by 1½ inches square, driven flush with the ground. It is located in the grounds of the Soldiers' Home, about 3 miles northeast of the union depot. It is distant 322.1 and 150 feet, respectively, from the corners of an inclosure east of this peg. It is 62 feet from the center of West Virginia avenue and south of it in line with the center of the road leading from West Virginia avenue to the "Dairy." It is also 113.8 feet southwest of the southwest corner of the band practice shed. The mark or range used was the tip of the Memorial Hall tower. This mark or range bears 91° 32′.5 east of true south.

Ross County, Chillicothe, 1900.—Observations were made over the north stone of the meridian line established in the city park by a number of local surveyors. The south stone of this meridian line is located in a clump of trees and can be easily found. The north stone extends 1¼ feet out of the ground and is about 1 foot in diameter. It is about 100 feet west of the front of the waterworks and is 38.6 feet from the post at the junction of the walk and the road to the west of it. The mark or range used was the south meridian stone of this meridian line.

Scioto County, Portsmouth, 1900.—Observations were made over the south stone of the meridian line established in 1885 by the United States Coast and Geodetic Survey. It is located in the southwest corner of the grounds of the Children's Home. It can be easily found on account of its size. The mark or range used was the north meridian stone, also located in the grounds of the Children's Home.

Summit County, Akron, 1900.—Observations were made over a block of marble 3 feet 1 inch long, set 31 inches in the ground, 6 by 6 inches on top, and lettered U. S. C. & G. S., with a cross in the center of it which marks the point. It was placed in the grounds of the county infirmary, about 1½ miles west of the town, on West Exchange street. It is located in the front lawn, 18 feet from the private drive leading to the infirmary and 123 feet from the line of trees along the road leading by the infirmary. The mark or range used was the east edge of the tree, at its base, just visible to the right of a wooden lamp-post. This mark or range bears 24° 45′.2 west of true south. The north corner of the main building bears 59° 20′.4 west of true north.

Trumbull County, Warren, 1900.—Observations were made over the north stone of the meridian line, located in the court-house grounds. The south stone of this meridian line is near the street-car track and should not be used for magnetic observations. The mark or range used was the south meridian stone of this meridian line.

Tuscarawas County, Tuscarawas, 1900.—Observations were made over a point in an open field about 1 mile northeast of town, on the property of E. S. Russell, of Alliance, Ohio. This field formerly belonged to Mr. J. Beickensderfer. It is on the bank of the Tuscarawas River near the bridge and just south of the road leading to Tuscarawas. Mr. J. J. Affolter, who lives in the farmhouse across the road, knows the exact location of this peg. It is distant 86.2 and 110.8 feet, respectively, from the center of the road to Tuscarawas and from a fir tree in front of the farmhouse. It is also distant 54.2 and 85.3 feet, respectively, from two chestnut trees on each side of the gate leading from the road into this field. The mark or range used was the tip of the schoolhouse tower. This mark or range bears 70° 42′.0 west of true south.

OHIO—Continued.

Washington County, Marietta, 1898.—The station is located in the grounds of the Marietta College observatory, about 75 feet northwest of the small equatorial. It is marked with a sandstone post with copper station mark. Some 500 or 600 feet south of this stone a similar stone was set, marking the true meridian. The mark or range used was the apex or gable of grain elevator, and bears 50° 50′ west of true south.

OKLAHOMA.

Beaver County, Beaver, 1900.—Observations were made over a stone post 6 by 6 inches on top and 3 feet long, set about 30 inches in the ground. The top of this stone is lettered U. S. C. & G. S., with a small hole in the center which marks the point. It is located on the top of a knoll about one-fourth of a mile west of the court-house, a short distance south of the wagon road leading into Beaver from the western section of the county. This stone post is southwest of the schoolhouse and about 150 yards southwest of Mr. Tannyhill's house. It is distant 176 and 300 feet, respectively, from the north fence and the northwest corner of the fence around Mr. Tannyhill's house and grounds. The mark or range used was the cupola of the schoolhouse. This mark or range bears 34° 38′.3 east of true south. The bracket on the east edge of the cupola of the church bears 53° 48′.6 east of true south.

Greer County, Mangum, 1900.—Observations were made over a stone post 6 by 6 inches on top and 3 feet long, set 30 inches in the ground. The top of this post is lettered U. S. C. & G. S., with a small hole in the center which marks the point. It is located about 300 or 400 yards southwest of the court-house square. It is set on a bluff overlooking the river, on a small semicircular promontory at the head of a large gulch. The mark or range used was the central tower of a distant windmill. This mark or range bears 37° 11′.2 west of true south. The spire of the Methodist church bears 18° 12′.7 east of true north. The belfry on stone schoolhouse bears 20° 50′.4 east of true north.

Noble County, Perry, 1901.—The station is near the southeast corner of the high-school grounds, about 30 feet from the east side, 20 feet from the south side, and 140 feet from the high-school building. It is marked by a stone, 5 by 10 inches on top, projecting about 5 inches above ground and lettered U. S. C. & G. S. S. M. Another stone was set about 300 feet due north of the first, near the northeast corner of the grounds to mark the true meridian. The steeple of the Colored Methodist church bears 6° 05′ west of true north.

Roger Mills County, Cheyenne, 1900.—Observations were made over a stone post, 6 by 6 inches on top and 3 feet long, set about 33 inches in the ground. The top is lettered U. S. C. & G. S., with a small hole in the center which marks the point. It is located in the court-house yard, approximately in line with the eastern wall of the court-house building and south of it. This post is distant 92.5, 101, and 93 feet, respectively, from the southeast and the southwest corners of the court-house building and from the northwest corner of the county jail. The mark or range used was a small flue on the front of a distant house on hill. This mark or range bears 5° 33′.2 east of true south. The east gable of the church bears 53° 09′.7 west of true south. The southwest corner of the court-house, about 4 feet above the ground, bears 23° 24′.3 west of true north.

Woodward County, Woodward, 1900.—Observations were made over a stone post, 6 by 6 inches on top and 3 feet long, set 33½ inches in the gronnd. The top of this post is lettered U. S. C. & G. S., with a small hole in its center which marks the point. It is placed on the vacant space about 180 feet north of the railway and northeast of the buildings used as a court-house and post-office. This post is distant 195, 250, and 157 feet, respectively, from an old dugout chimney, from the corner of a wire fence, and from the corner of the inclosure around the house north of the station. The mark or range used was the tip of cupola on the red barn nearly south of the station. This mark or range bears 3° 16′.3 west of true south. The spire of the Baptist church bears 11° 53′.9 west of true south. Tip of the belfry on the schoolhouse bears 22° 35′.7 east of true south.

OREGON.

Benton County, Yaquina, 1888.—The station is on the bluff, above and north of the town, near the white church with a bell tower on the west end. It is in the meridian of the brick astronomical pier, 20.4 meters south of it.

Columbia County, Rainier, 1886.—The station is distant 67.8 feet 30° 21.′6 west of true south

OREGON—Continued.

from the geodetic station. It is marked by a cedar post about 10 inches in diameter and projecting about 30 inches above the ground. The mark used was the azimuth mark over Rinearson triangulation station and it bears 60° 26′.8 west of true north.

Coos County, Coos Bay, 1889.—Compass bearings were taken at the following triangulation stations, but the results are only approximate: Loggie, Ross, Fossil 2, North Spit, Pigeon 2, Coos River Hill, White Point 2, Marshfield Hill, Crawford 2, Pierce Cemetery, Empire 2, Pest, Simpson, North Bend 2, Pony, Hutchinson 2, North Slough, Mabry.

Douglas County, Tenmile Knoll, 1887.—The station is situated on a small knoll, on the north side of Tenmile Creek, between the Umpquah and Siuslaw rivers. It is about 600 yards east of the ocean beach.

Lane County, Cannery Hill, 1887.—The station is located upon the summit of a chaparral covered sand hill on the north side of the Siuslaw River, just inside the entrance.

Lincoln County, Yaquina Point Light, 1885.—The station is south of the barn belonging to the light-house. It is marked by an oak tent pin driven over a bottle set underground. The east gable of the keeper's house bears 42° 01′ west of true north and Cape Foulweather light-house bears 60° 04′ west of true north.

Multnomah County, Portland, 1900.—The station is on the hill near the northwest corner of City Park, on the highest ground, within the loop which terminates the driveway. It is marked by a sandstone post 6 inches square on top, the pyramidal top projecting above the surface. The mark or range used was the flagstaff on the Marquham Hotel and bears 77° 11′ east of true south. The court-house flagstaff bears 68° 31′ east of true south.

PENNSYLVANIA.

Adams County, Gettysburg, 1901.—Observations were made at the south stone of a meridian line about 700 feet long, located on the county farm at the northeast edge of the town. The line is marked by dark-grained marble posts 6 inches square and lettered U. S. C. & G. S. S. M. (or N. M.–). The south stone is in the large field northwest of the barn. It is immediately north of the small orchard and 25 feet from the wooden rail fence. The mark or range used was the tip of the tower on the main college building. This mark or range bears 40° 40′.6 west of true south.

Allegheny County, Allegheny, 1885.—The station is 171 feet 7 inches due north of the center of the transit instrument at Allegheny Observatory.

Bedford County, Bedford, 1902.—The meridian line established by the county surveyor in 1877 back of the court-house was tested and it was found that the south stone bore from the north stone 0° 03′.4 west of true south. As this station is not suitable for magnetic observations the magnetic station was located on the grounds of the Arandale Hotel south of town. It is in the large field back of the hotel, across the brook about 200 feet. It is about 150 feet east of the line joining the first two apple trees and about 10 feet southeast of a stump projecting about 6 inches out of the ground. It is 152.0 feet, 173.6 feet and 181.8 feet, respectively, from the nearest three apple trees. It is marked by a marble stone 3 feet long and 9½ inches square, set flush with the ground and lettered U. S. C. & G. S. 1902. The half-inch hole drilled in the center marks the point. The mark used was the spire of the Methodist church (the one with a cross), bearing 17° 51.′12 west of true north.

Berks County, Reading, 1900.—Observations were made over a point located on the farm of Mr. William Irwin, which is about 2 miles from Reading in a southerly direction, and is about 1 mile east of the "Kicks House." This point is located in the field west of Mr. Irwin's house and orchard. It is near the public road in the northwest corner of his field, and is distant 14.5 and 84.8 feet, respectively, from its north and west fences. It is also distant 86.5 and 46 feet, respectively, from the central trees of two clumps of cherry trees across the road from this station. The mark or range used was the ridge of an old barn over the ridge to the southward. This mark or range bears 9° 39′.0 west of true south.

Blair County, Altoona, 1900.—Observations were made over a copper tack in a stub driven almost flush with the ground. It was located on land owned by Mr. Scott Gwines, a surveyor of Altoona. It is about 1½ or 2 miles in a northerly direction from the Pennsylvania Railroad station on the Juniata Gap road. This stub was located 304.6 feet in the rear of Mr. James Young's house, and is

PENNSYLVANIA—Continued.

distant 196.6 feet from the fence just south of the station. The mark or range used was the point of the cupola of the Fairfield schoolhouse. This mark or range bears 26° 47′.2 east of true south. The chimney of Mr. James Young's house bears 64° 22′.2 east of true south.

Cambria County, Ebensburg, 1901.—Observations were made over a marble post located in the southeast corner of the court-house yard. This post is 6¼ inches square on top, projects about 3 inches above ground, and is lettered U. S. C. & G. S. A church spire bears 26° 01′.3 east of true north. The steeple on the third house south of the southwest corner of the court-house yard bears 47° 28′.9 west of true south.

Center County, Bellefonte, 1901.—Observations were made over a sandstone post located in a field owned by Mr. T. A. Shoemaker, of Bellefonte, and known as "Half Moon Hill." This post is 7 by 8 inches at the top, projects about 4 inches above ground, and is lettered U. S. C. & G. S. It is about one-quarter of a mile west of the Pennsylvania Railroad station, and is between the houses of George Meese and Mrs. Rapp. It is 113.8 feet from the west corner of George Meese's yard and 113.2 feet from the south fence of the field next to the road. The tallest church spire visible bears 63° 13′.4 east of true north. The church spire with the cross on it bears 36° 50′.9 east of true north.

Center County, Ingleby, 1900.—Observations were made over a large rock, a corner of which projects above the ground. This rock is marked by a cross with a small hole marking the center. It is located in a clump of trees about three-eighths of a mile north of the railway station and about one-fourth of a mile east of the Barker stock farm. It is distant 65.5, 60.5, 73.5, and 59 feet, respectively, from a small cherry tree, from a chestnut tree, from a pine tree, and from an oak bush. The mark or range used was a pine tree on the mountain. This mark or range bears 7° 42′.3 west of true south.

Chester County, West Chester, 1901.—The station is on the athletic grounds of the West Chester Normal School. It is 57 paces west of the starting posts for the 100-yard dash, and 13.5 feet north of the straight cinder track, and is marked by a block of marble 12 inches square, projecting several inches above the ground. The Episcopal church tower bears 5° 09′.4 west of true north. The base of the flag pole on the public schoolhouse bears 1° 16′.2 east of true north.

Clearfield County, Clearfield, 1901.—Observations were made over the south stone of the meridian line established in 1895 by the county surveyor near the county home. This stone is about 50 feet beyond the drive leading from the road into the home. It is of brown sandstone 0.9 by 1.5 feet on top and projects about a foot above ground. A similar stone about one-fourth mile distant marks the north end of the line. The instrument was centered over the middle of the west edge of south stone. The west edge of the north stone bears 0° 00′.7 east of true north. The west corner of the county home bears 29° 18′.1 west of true south. The south corner of the same bears 44° 32′.2 west of true south.

Clinton County, Lock Haven, 1901.—Observations were made over a white marble post 6¼ inches square, projecting 3¼ inches above ground, and lettered U. S. C. & G. S. This post is on a piece of public land along the river front, east of the wooden bridge. It is 16 feet from the river bank and 62 feet east of the canal. The southeast edge of a house with four pillars, across the river, bears 23° 00′.4 east of true north.

Cumberland County, Carlisle, 1901.—Observations were made at the south stone of the meridian line located on the fair grounds north of the town. The line is about 700 feet long and is marked by 2 marble posts 6 inches square and lettered U. S. C. & G. S. S. M. (or N. M.) The south stone is 85 feet from the south post of the gate leading into the grounds at the southeast corner of the track, and also 164.6 feet from the southeast corner of the stand within the race track.

Dauphin County, Harrisburg, 1901.—Observations were made at the north stone of the meridian line located on Hargests (or Forsters) Island. The line is marked by 2 marble posts 5¼ inches square and lettered U. S. C. & G. S. N. M. (or S. M.) The north stone is 77.5 feet from the south corner of the stable and 77.7 feet from the north corner of the grand stand. The mark or range used was the east edge of a tall brick chimney across the river. This mark or range bears 8° 15′.0 east of true south. The flagstaff on the opera house bears 54° 08′.4 east of true north.

Erie County, Erie, 1885.—The station is located in the grounds of the marine hospital, 138 feet 1 inch east-southeast of the southeast corner of the hospital building.

Fayette County, Mason and Dixon line, 1897.—The observations were made at a point in the field 273 feet north of the Michler monument, which marks the intersection of the Michler meridian line with the Pennsylvania or Mason and Dixon line.

PENNSYLVANIA—Continued.

Fayette County, Uniontown, 1901.—Observations were made at the south stone of the meridian line located on the fair grounds, north of the town. This line was established by the county in 1851. It is about 1 200 feet long and is marked by drill holes in two rough stone posts 4 by 7 inches and projecting 6 inches above ground. The north stone is 2½ feet from the wooden fence opposite the north end of the race track. The south stone is within the track and is 3 feet from the south end of the track. The tip of the court-house tower bears 8° 43′.3 east of true south.

Franklin County, Chambersburg, 1900.—Observations were made over the center of a granite post about midway between the north and south meridian stones of the meridian line which had been established at the almshouse farm. It is 206.1 feet north of the south meridian stone and about 130 feet east of a large tree. Its position is well known. The almshouse is about 1½ miles east of Chambersburg, and is adjacent to a small village called Stoufferstown. The mark or range used was the western ridge of a frame building, and it bears 8° 12′.5 east of true south.

Franklin County, Fannettsburg, 1900.—Observations were made over a point located in the pasture field of the Rev. Mr. Gordon, about 300 or 350 yards from the hotel. It is distant 133.4 and 44.3 feet, respectively, from the northwest corner of this pasture field, and from its north fence line. It is distant 79.2, 63.5, and 46.9 feet, respectively, from three cherry trees north of the station, and north of the fence line. It is also distant 48.6 feet from an apple tree east of the station. The mark or range used was the ridge of a barn. This mark or range bears 24° 48′.4 east of true south.

Greene County, Waynesburg, 1901.—Observations were made over the north stone of the meridian line. This is a stone set in a larger stone about 2 feet square. It is about 300 feet north of the public school and Waynesburg College. The south stone is in the sidewalk near the northwest corner of the court-house This line was established by the county in the year 1850. This station was reoccupied in July, 1902, for the purpose of testing the meridian line established by the county surveyor in 1850. It was found that the *south stone instead of bearing due south from the north stone bears 0° 34′.8 west of true south.*

Huntingdon County, Huntingdon, 1900.—Observations were made over a tack in a stub located on the farm of Mr. J. Murran Africa, C. E., situated on the Lower Rock Creek road, east of Huntingdon. Mr. Africa established a meridian line on his farm in 1880 and marked it with meridian stones about 2 by 5 inches on top. The center is marked with a cross in a lead bolt. On account of the nature of the ground these stones could not be occupied. The stub is distant 21.46 feet south of the north meridian stone and 244.5 feet north of the south meridian stone. It is also distant 21.6 feet from a fence near the north stone and 81.3 feet from a fir tree southeast of the station. The mark or range used was the cupola of the court-house tower. This mark or range bears 48° 47′.2 west of true south.

Indiana County, Indiana; 1901.—Observations were made over the south stone of the meridian line established in 1899 by the United States Geological Survey on the campus of the Indiana State Normal School This stone is in front of the south front of the main building and about 75 feet nearly south of the fountain. The stones are 6 inches square on top and have copper disks sunk into them. They project several inches above ground. The mark or range used was the spire of the United Presbyterian church. This mark or range bears 41° 52′.7 east of true north.

Lancaster County, Lancaster, 1901.—Observations were made at a point 32¼ feet east and 2 feet north of the south stone of a meridian line on the grounds of the Children's Home in the southeast quarter of the city. This line is about 400 feet long and is marked by two limestone posts 8 inches square, projecting 3 inches above ground, and lettered U. S. C. & G. S. N. M. (or S. M.). The centers of the drill holes in the stones designate the meridian line.

Lebanon County, Lebanon, 1901.—Observations were made at the south stone of a meridian line 500 feet long located in the first field west of the county almshouse. The line is marked by marble posts 6¼ inches square, projecting 4 inches above ground, and lettered U. S. C. & G. S. N. M. (or S. M.). The south stone is on the south side of the creek and 9 feet from the fence along the road. The north stone is on the other side of the creek and 10 feet from the fence. The mark or range used was the church spire, which bears 1° 17′.8 west of true north.

Lycoming County, Williamsport, 1901.—Observations were made over the south stone of the meridian line established in Brandon Park by the United States Geological Survey. The line is about 500 feet long and is marked by stone posts 0.40 by 0.65 foot cross section. These posts project

PENNSYLVANIA—Continued.

about 4 inches above ground and have copper disks inserted in their tops with cross marks cut in the copper to mark the exact points. The south stone is about 100 feet east, slightly north, of a large granite drinking fountain.

Mifflin County, Lewistown, 1900.—Observations were made over the south stone of the county meridian line established on the almshouse farm, about three-fourths of a mile northeast of town. These stones are five inches square, and they can be easily found. One is near a private road and the other is near a public road. The mark or range used was the tip of the court-house dome. This mark or range bears 72° 24′.6 west of true south.

Montgomery County, Hatboro, 1900.—Observations were made over a copper tack in a small stake located on the farm of Mr. Harry Woodfall, about a mile east of the town. This stake is driven in the ground about the center of a pasture field south of Mr. Woodfall's house. It is distant 89.5, 186.8, 216.2, and 230.1 feet, respectively, from the west, from the south, from the east fences of this pasture field, and from its northwest corner next to the road. It is also distant 301.2 feet from a cherry tree near the southwest corner of Mr. Woodfall's house. The mark or range used was the lightning rod on the cupola of Mr. John Lloyd's barn. This mark or range bears 21° 54′.8 west of true south.

Perry County, Andersonburg, 1900.—Observations were made over a point located in the pasture field of the Loys, about 800 feet east of the post-office. This pasture is second field from Judge Garber's property and across the road from the Loys' barn. The point is distant 161 and 119 feet, respectively, from the northwest corner of the Loys' barn, southeast of the station, and from a large apple tree north of the station. It is also distant 109, 28, and 109.7 feet, respectively, from the fences south and west of the station and the southwest corner of this pasture field, next to the road. The mark or range used was the eastern ridge of Mr. McKee's barn. This mark or range bears 88° 39′.4 west of true south.

Perry County, Newport, 1900.—Observations were made over a point located on the property of Mr. Gibson Fickes, about three-eighths of a mile north of the town, about 350 feet east of the Pennsylvania Railway, and northwest of the ball grounds. This point is in line with the Fickes's farmhouse and the chimney of a brick factory. It is also in line with Mr. Fickes's barn and the residence of Mr. Myers. It is distant 252.8, 291.2, and 134 feet, respectively, from the southeast corner of the foundation of the large barn northwest of the station, from the southeast corner of a farmhouse southwest of the station, and from the center of North Fourth street, east of the station. It is also distant 27.5, 113.3, and 108.5 feet, respectively, from the fences north, south, and east of the station. It is distant 78.4 and 64.8 feet, respectively, from two large cherry trees northeast of the station. The mark or range used was the spire of the Presbyterian church. This mark or range bears 44° 35′.6 east of true south.

Philadelphia County, Philadelphia, 1895.—Observations were made over a dressed-marble post 4 inches by 4 inches by 30 inches, with intersecting grooves, sunk flush with surface of the ground. This post is located in the grounds of the Pennsylvania Hospital for the Insane, near Forty-first and West Market streets, distant 50 yards from the center of the Doric Summer House. The mark or range used was the spire of the Reformed Episcopal church and bears 14° 55′.3 east of true south. Rod on the chimney of the "Fisher Ward North" bears 79° 47′.0 west of true north.

Philadelphia County, Philadelphia, Girard College, 1890.—The station is marked by a dressed-marble post 18 inches long and 4 by 4 inches on top and lettered U. S. C. S. It is sunk flush with surface of the ground, and is distant 109 feet from the outer edge of the curbstone of the paved road running through the college grounds, just south of the mechanical school building. It is also distant 295 feet from the inner edge of the western stone wall around these grounds. No longer suitable for magnetic observations.

Schuylkill County, Pottsville, 1900.—Observations were made over a point located on the farm of Mrs. Germy, about one-half a mile northwest of the court-house. This point is on the south slope of a hill southwest of Mrs. Germy's house, distant 51.4 feet from a lone tree which is in line between this point and the court-house tower. The mark or range used was the cross on St. John's church, which is seen over Mrs. Germy's house. This mark or range bears 27° 28′.1 east of true south.

Snyder County, Middleburg, 1901.—Observations were made over a wooden stub driven all but 2 inches into the ground. This stub is located in a small orchard back of the house and stable of

PENNSYLVANIA—Continued.

Mr. J. F. Stetler. It is 43.3 feet from the corner of the stable, 17.2 feet from the line of the stable produced on the west side, and 28 feet from a small apple tree (the one closest to the stable). The center of the ball on the church tower bears 32° 53′.3 west of true north.

Somerset County, Somerset, 1901.—Observations were made over the wooden post midway between the ends of the meridian line established in the court-house yard. The ends are marked by cast-iron bars about 4 feet long, firmly set in stones. This line was established by the county surveyor in 1875.

Union County, Lewisburg, 1900.—Observations were made over a point located in the college campus, about 300 feet south of the college building, on the right-hand side of the road leading to the main building, and near the fork in the roads. It is in line with a row of shade trees and is distant 31.2 and 65 feet, respectively, from the first tree east and from the first west of the station. The mark or range used was the central lightning rod on Mr. Frank Miller's barn. This mark or range bears 48° 04′.2 west of true south.

Washington County, Washington, 1901.—Observations were made over the south stone of the meridian line located on the front campus of Washington and Jefferson College. This stone is near the southwest corner of the campus, and the north stone is about 500 feet distant. The line was established by the United States Geological Survey in 1900.

Westmoreland County, Greensburg, 1901.—Observations were made at the south stone of the meridian line located in the field back of the east wing of the county home. This line is marked by two marble posts 6 inches square and lettered U. S. C. & G. S. S. M. (or N. M.). The south stone is about 90 feet from the hedge fence and about 200 feet from the wooden fence along the road at the back of the home. The north stone is about 350 feet distant from the south stone. The mark or range used was the right edge of a school building about a mile distant. This mark or range bears 69° 03′.3 east of true north.

York County, York, 1901.—Observations were made at the south stone of a meridian line 700 feet long, located in a field owned by Mr. Small. The line is marked by two granite posts 6 inches square and lettered U. S. C. & G. S. S. M. (or N. M.). The south stone is south, a little east, of the only tree in the interior of the field, 19 feet from the tree, 510 feet from the wooden fence along the road, and 452 feet from the creek bank. The mark or range used was the flagstaff on the foundry across the top of an iron bridge. This mark or range bears 12° 29′.3 west of true south.

PHILIPPINE ISLANDS.

Dumaguete, Negros, 1901.—Magnetic observations were made at a point on the beach 30 meters north of the astronomical station on the line to the azimuth mark which bears 0° 00′.5 east of true north.

Maasin, Leyte, 1901.—Megnetic observations were made at a point 20.6 meters south of the astronomical station on the line passing through it from the azimuth mark which bears 0° 01′.3 east of true north. It is marked by a small bamboo stake.

Ormoc, Leyte, 1901.—Magnetic observations were made at a point 82.31 meters due north of the astronomical station which is on the north side of the public square. It is marked by a wooden peg.

Tacloban, Leyte, 1901.—Megnetic observations were made at a point on the beach 23.9 meters north of the astronomical station on the line to the azimuth mark on Samar Island which bears 0° 01′.5 west of true north. It is marked by a wooden stake.

Batangas, Luzon, 1901.—Magnetic observations were made at the astronomical station, which is about 4 meters south of the road leading from Batangas to the beach, about half a mile west of Batangas Plaza and three-fifths of a mile east of the beach. It is just inside the low dikes of a rice field, and is marked by a stone 8½ by 12 inches on top and projecting 8 inches above ground, with a drill hole and the letters U. S. cut on its top surface. The stone is surrounded by three posts. The cross on the dome of the Batangas church bears 76° 06′.6 east of south.

Balayan, Luzon, 1901.—The station is in Calle de la Fe, 211.43 meters from the astronomical station, and is marked by a cross cut on a bowlder, flush with the surface of the street and about midway between the center and north side of the street. The mark or range used was the center of the church

PHILIPPINE ISLANDS—Continued.

dome, and bears 56° 12′.7 west of true south. The astronomical station is in the north end of the Plaza Rizal, 84.3, 16.0, and 40.1 meters, respectively, from the southeast corner of the churchyard wall, the southeast corner of the stone guardhouse, and the southwest corner of military headquarters. It is marked by a granite stone 12 by 4 inches on top, projecting 12 inches above ground, having a drill hole on top and lettered U. S. on its south face.

Subig, Luzon, 1901.—Magnetic observations were made at two points near the astronomical station in Subig, one 20 feet due south and the other 15 feet distant in line to Point, a little south of west. The astronomical station is in a grove of cocoanut palms at the south end of the principal north and south street of the town, about the center of the street and 50 feet from mean high-water mark. It is marked by a stone 6 by 8 by 21 inches, projecting about 3 inches above ground and having a drill hole in its center. It is 11.8 meters from the southwest corner of the house on the east side of the street and 12 meters from the southeast corner of the house on the west side of the street.

Iba, Luzon, 1901.—Magnetic observations were made at a point 60 feet due north of the astronomical station. The astronomical station is about 1 mile due west of the town of Iba, on a broad, smooth plateau which is about 8 feet above mean high water. It is on a point, about 100 meters from high-water mark and north of the quartermaster's freight house, being 73 meters from the center of the north end of it. It is marked by a granite stone 20 by 20 by 3 inches, set on edge, with the broad faces north and south, and projecting about 5 inches above ground. There is a drill hole on top, and the letters U. S. are cut on the south face.

Santa Cruz, Luzon, 1901.—Magnetic observations were made at a point 40 feet due south of the astronomical station. This astronomical station is at the west end of the town plaza, about 50 meters from high-water mark of the bay. It is 89.8 meters, 68.2 meters, and 44.1 meters, respectively, from the northeast and northwest corners of the convent (barracks) and the northwest corner of the adjoining courtyard. It is marked by an irregular-shaped sandstone about 18 by 14 inches, projecting 6 inches above ground, having a drill hole on top and lettered U. S. on the north face.

Sual, Luzon 1901.—Magnetic observations were made at the astronomical station on the shore north of the military hospital. It is about 100 feet from the hospital and 30 feet from high-water mark, and is marked by a pier of granite 1.6 by 2.1 feet, standing 2.4 feet above ground, having a drill hole and the letters U. S. cut in its upper surface.

San Fernando de Union, Luzon, 1901.—Magnetic observations were made at a point on the beach 70 meters due north of the astronomical station. This astronomical station is at the north side of the foot of Main street, 26.7 meters west of the Port's large flagstaff. It is marked by a stone 6 by 8 by 18 inches projecting about 4 inches above ground, with a drill hole in its top. A line from the southwest corner of the United States commissary warehouse to the flag pole would pass about 2 meters north of the astronomical station.

Candon, Luzon, 1901.—Magnetic observations were made at a point 50 meters due south of the astronomical station, which is just outside of Candon on the south side of the road to beach, near a double-arched brick culvert. This astronomical station is 18.6 meters from the center of the middle support of the culvert and 27.6 meters from the pier at the eastern end of the brick wall on the south side of the road. It is marked by a stone 3½ by 5 inches on top, projecting about 4 inches above ground and having a three-fourths inch drill hole on top. Due south 700 meters a similar stone was set for an azimuth mark. It is 15.5 meters south of the south edge of a ditch between two rice fields, and 160 meters west of a culvert in the main road leading from Candon to the south.

Vigan, Luzon, 1901.—Magnetic observations were made at the astronomical station situated in the inclosure of the race track, about one-half mile west of south of the center of the town, and about one-third mile due south of the chapel in the town cemetery, the true north line from the station cutting the tower of the chapel near its center. The station is marked by a stone 13 by 3½ inches on top, projecting about 5 inches above ground, having a drill hole on top and lettered U. S. C. G. S. on its north face. It is southwest of two prominent masonry piers, 182 feet from one and 274.6 feet from the other. About 5 feet south of the south wall of the Vigan cemetery a stone was set to mark the true meridian. This stone is 12 by 3 inches, with a drill hole in its top surface, and projects about 5 inches above ground.

Currimao, Luzon, 1901.—Observations were made at two points near the astronomical station. This station is near the eastern end of a building the lower story of which is of stone, the first one west

PHILIPPINE ISLANDS—Continued.

of the warehouse of the General Tobacco Company. It is 9.96, 8.35, and 51.19 meters, respectively, from the northeast and southeast corners of the former and southwest corner of the latter. The astronomical station is marked by a stone about 6 by 18 by 30 inches, projecting about 6 inches above ground and having a drill hole in its center. The first magnetic station was 7 meters from this stone and in line with it and the west side of a small building on the lower point of Currimao Harbor. The mark or range used was a point on the old Spanish blockhouse and bears 25° 37′.2 east of true south. The second magnetic station was 20 meters from the stone and in line with "Rocky Bluff." The mark or range used was "Rocky Bluff" and bears 16° 27′.4 west of true south.

Aparri, Luzon, 1901.—Observations were made in the open street, about 200 meters south of a stone set in the northeast corner of the main plaza or parade ground. This stone is about 5 by 10 by 20 inches, planted with 3 or 4 inches projecting above ground. In the top of the stone a hole is drilled 1½ inches deep.

PORTO RICO.

Punta Viento No. 2, 1901.—The station is located on a shingle beach at Punta Viento about 60 feet from the high-water mark on line between Punta Figura light-house and Punta Viento No. 2 triangulation station. The latter is located at the southeast corner of Punta Viento, about 50 meters from the southwest corner of the bay at the high-water mark, and is marked by a heavy braced pitch-pine pole over a 2-inch iron pipe filled with cement and pebbles and set in cement even with the surface of the shingle. The mark or range used was Punta Figura light-house and bears 79° 14′.7 west of true south.

Corazon, 1901.—The station is north from the road between Arroyo and Guayama, at the lane leading to the house of Carlos McCormick, on a grass-covered foothill of Cerro de San Bernaldo. About one-fourth mile of the road in front of the Arroyo cemetery, if continued, would pass 500 or 600 feet east of the station. It is marked by a braced pole over an iron pipe set in cement in a hole in the ground. The mark or range used was Punta Figura light-house and bears 33° 30′ east of true south.

Ponce, 1901.—The station is located on a high hill about 1 mile north of the Plaza of Ponce. It is in a pasture on the highest part of the eastern end of the hill almost in line with the street running north and south on the west side of the Plaza Principal. The exact point is marked by a coast survey brass station mark set in a grouting of cement and stone, its top even with the surface of the ground. The mark or range used was Cardona light-house and bears 13° 19′.0 west of true south.

Santa Helena, 1901.—The station is located on Santa Helena Mountain, on the line between Punta Tuna light-house and Santa Helena triangulation station. The latter is located on the highest summit between the Maunabo and Yabucoa road through the Pandura Pass and the coast. It is on a clear and and grassy hilltop, southwest of a bowlder about 3 feet high and 6 feet long, and 38.18 and 33.55 feet measured on slope, respectively, from a blazed wild-orange tree and nearest corner of a barbed-wire fence. The triangulation station is marked by a 2-inch iron pipe, 15 inches long, set in cement almost even with the surface of the ground, under a 20-foot braced pole. The mark or range used was Punta Tuna light-house and bears 21° 25′ west of true south.

Aibonita, 1901.—The station is located on a prominent hill about 1 mile south of the town of Aibonita, which is on the military road between Ponce and San Juan. It is about 61 feet northwest from the Aibonita triangulation station and about 108 feet northwest of an old house. The exact point is marked by a small cross cut on a hemispherical bowlder about 3 feet in diameter. The mark or range used was the flagstaff on a schoolhouse and bears 52° 29′.6 west of true south. Muertos light-house bears 46° 38′.0 west of true south.

Vieques Island, Isabella Segunda, 1901.—The station is on the hill just south of the village of Isabella Segunda, 26.4 feet east of the most southerly and 49.2 feet south of the most easterly of a clump of trees. It is marked by a brass station mark, secured with cement in the top of a 4-inch tile drain pipe, which was set in cement with its top even with the ground. The mark or range used was the signal at Middle triangulation station, on the highest part of the grassy ridge to the southward, and bears 7° 01′.0 east of true south.

Lima, 1901.—This station is the triangulation station on Lima point, southwest of Bahia Honda. It is on a rounded promontory mostly covered with trees, in a little grassy glade a little east of the highest point of the hill, and in line with the top of the bluff at Point Algodon and the point of South

PORTO RICO—Continued.

Cabras Island. It is marked by an iron bolt with a square head, set in a mass of rocks and concrete under a tripod signal. The mark or range used was Batata triangulation station, and bears 48° 25′.5 west of true south.

Mesa, 1901.—The station is located on the long hill east of Mayaguez, on the road to Rosario. It is across the road from the west end of a grove on the small coffee plantation of Manuel Ramon, about 6 meters south of the road, 9 meters northwest from a mango tree about 18 inches in diameter, and 12.9 meters from a mamey tree in Ramon's fence, this tree being 16 meters from the southwest corner of the plantation. The exact point is marked by a 2-inch iron pipe, 22 inches long, set in cement in the ground, and projecting about 4 inches. Buena Vista triangulation station bears 8° 33′.4 west of true south.

Culebra Island, Culebra, 1901.—The station is located on Grand Harbor, at the eastern edge of the only village on Culebra Island. It is about 150 feet north of east from the boat landing, and is marked by a 3-inch tile drain pipe, 12 inches long, set in cement, with its upper end even with the surface of the ground, and one of the coast survey brass station marks secured by cement in the upper end. The mark or range used was a tripod signal on the reef west of the main entrance to the harbor and bears 16° 14′.9 east of true south. The cupola of the church bears 26° 00′.0 west of true north.

Atalaya, 1901.—The station is located on the highest mountain peak back of Tres Hermanos station, on the Mayaguez and Aguadilla railroad, and east of Corsica. It is about the center of the highest part of a treeless peak owned by Miguel Carrero, whose house is about 75 feet vertically below it to the east. The exact point is marked by a 2-inch iron pipe set in cement and projecting 2½ inches above the ground. The mark or range used was the red chimney of the sugar mill of Domingo Raffucci, in Corsica, and bears 85° 26′.2 west of true north.

La Punta, 1901.—The station is on the ridge which extends inland from Punta Jiguero light-house. It is near the summit, 26.83 and 39.39 feet, respectively, from the southeast and southwest corners of the house of Eusebio Sanchez and 7 feet north from the trail between the light-house and Aguada. The exact point is marked by a 2-inch iron pipe, 18 inches long, filled with cement and set in cement in a hole in the ground. The mark or range used was Rincon triangulation station and bears 88° 46′.3 west of south.

Cruz, 1902.—The station is about 4 miles west of Cape San Juan light-house on the prolongation of the line from the light-house to Cruz triangulation station, about 40 feet from the latter. The triangulation station is on a prominent rocky mound on the coast at Loquillo and is marked by a 2-inch iron pipe set in cement and projecting above the ground in a mound of cement. The mark or range used was the light-house and bears 85° 33′.9 east of true north.

Loiza, 1902.—The station is on the coast about one-fourth mile north of Loiza. It is on the sand beach near the mouth of Loiza River and is marked by a temporary topographic signal. The mark or range used was the north gable of the house of Judge Cepeda and bears 18° 07′.9 west of true south.

Aguadilla, 1901.—The station is located on the beach at Aguadilla. It is marked by a stub set in the sand about the high-water mark. The mark or range used was Aguadilla triangulation station and bears 32° 58′.5 east of true north.

Baja, 1901.—The station is on the highest hill near Vega Baja, called "Cueva de las Golondrinas." It is the highest point, 20 feet from the west edge of a declivity and about one-third mile southwest from the plaza. The exact point is marked by a 2-inch galvanized iron pipe set in cement in a hole drilled in the rock. The mark or range used was the tall chimney at the Becenti sugar plantation and bears 50° 22′.2 east of true north.

Club, 1902.—The station is about 2½ miles east of San Juan on the line between a flag on the north cupola of San Mateo Chu ch and "Club" triangulation station, 45 feet from the latter. The triangulation station is about 300 yards west of the "clubhouse" and is marked by a 2-inch iron pipe, 2 feet long, set in cement and projecting about 6 inches above the ground. The mark or range used was the flag and bears 19° 14′.0 east of true south.

North Base, near San Juan, 1901.—The station is North Base triangulation station and is located on the opposite side of the bay from San Juan and southwest of Morro Castle. It is about 60 feet from the shore line. The exact point is marked by the top of a glass bottle, set in a cement pier about 14

PORTO RICO—Continued.

inches in diameter at the top, which is even with the surface of the ground. The mark or range used was South Base triangulation station, distant 1 094 meters, and bears 6° 56′.8 west of true south. The center of the top of the brick smokestack of a sugar refinery bears 43° 59′.8 west of true south.

Fraile, 1901.—The station is about three-fourths mile west of Rio Platte, on Savaha Hill, on the coast. It is on a rocky point, the highest but one of a group and the second from the west. It is about 600 feet northeast from a cabin. The exact point is marked by a 2-inch galvanized-iron pipe set in cement in a hole drilled in the rock and projecting 5 inches above the ground.

Amador, 1901.—The station is on the coast, about one-half mile northwest of Camuy. It is on a high sandhill called "Cerra la Playa," about 75 meters south of the ocean shore and 650 meters from the main north and south street through Camuy, and is marked by a 2-inch iron pipe set in cement.

Point Caracoles, 1901.—The station is located on the coast, about 1½ miles east of the Arecibo light-house. It is on a rocky point, and marked by a stub about 18 inches long and signal pole and flag. The mark or range used was Arecibo light-house, and bears 73° 30′.6 west of true south.

RHODE ISLAND.

Newport County, Coasters Harbor Island, Newport, 1896.—Station is at a point about midway between the Naval War College building and the reservoir. Station is marked by a pine stub, about in line with the northwest corners of the reservoir and War College.

Providence County, Providence, 1895.—Station is in the center of the athletic grounds of Brown University.

Washington County, Boston Neck, 1899.—Station is on the farm of T. G. Hazard, about 2 miles northeast of Narragansett Pier. It is near the center of the large field east of the farm buildings. It is about 200 feet from the west wall, in line between a point 2 feet south of the barnyard gateway and Beavertail light-house. It is 9 inches east of a drill hole in a rock in the same line. The mark or range used was the Beavertail light-house, and bears 87° 52′.4 east of true south. Whale Rock light-house bears 63° 31′.3 east of true south.

Washington County, McSparran Hill, 1899.—Station is 20.8 feet to the northeast of the triangulation station McSparran 3, which is marked by a drill hole in the outcropping ledge. The angle at magnetic station between McSparran 3 and Beavertail Light-House is 22° 25′. From the magnetic station Narrangansett Baptist church spire bears 80° 16′.2 east of true south. Beavertail light-house bears 42° 13′.8 east of true south.

SOUTH CAROLINA.

Barnwell County, Aiken, 1885.—The station is located in the open lot southeast of the court-house. The point is almost due south of the German Transit of Venus station of 1882. The magnetic station is marked by a granite post sunk flush with the surface of the ground. Another stone set due north in the center of Railroad avenue marks the true meridian. The stone is distant 28 yards from the southeast corner of the court-house.

Beaufort County, Woods, 1902.—The station is in the strip of woods about a mile south of the Baldwin phosphate works, on the west bank of Beaufort River. It is about 200 meters from the river bank, in line between Baldwin tall chimney and Paris Island rear beacon, about 50 meters north of the first small house on the south side of the woods. It is just east of the first bend in the old road which enters the woods near this house. The mark or range used was the Paris Island rear beacon, which bears 0° 01′.6 west of true south.

Charleston County, Bay Point, 1902.—The station is on the east bank of the South Edisto River, about 100 meters south of the first large creek that empties into the river above its mouth and about a mile from the extremity of Bay Point. It is on the grass just back of the first sand ridge.

Charleston County, Live Oak, 1902.—The station is on the southeast point of a rounded hummock, thickly wooded and surrounded by marsh, about 200 meters east of the woods on the mainland of Christ Church parish. The mark or range used was Cape Romain light-house, which bears 73° 39′.1 east of true south.

SOUTH CAROLINA—Continued

Charleston County, Charleston, 1902.—The station is about 60 yards northeast of the Truesdale house on Sullivan's Island.

Florence County, Florence, 1891.—The station is in the northwest corner of the grounds of the national cemetery. It is marked by a pine post 2 feet long, sunk 2 feet in the ground. This post is 15 feet south of the brick wall at north side of cemetery and 25.3 feet east of the west brick wall.

Marion County, Marion, 1891.—The station is in the northwest suburbs of the town, in the open lot just in front of the livery stable of the Planters' Hotel, and just south of and adjoining the property of Mr. W. H. Cross. The station is marked by a yellow-pine post which is 45.1 feet from the southern fence of the Cross property, and also 104 feet east of the southwest corner of this same property.

Richland County, Columbia, 1900.—The station is in the southwest corner of the capitol grounds, 40 feet from Senate street and about 225 feet from the southwest corner of the statehouse.

Spartanburg County, Baker, 1896.—The station is on the land of Mr. Baker, about a mile south of Pelham. It is about 100 meters east of the old Indian boundary line, on the top of a small knoll east of the road and about 150 meters southeast of Sam Hitching's old store.

Spartanburg County, Block House, 1896.—The station is 100 feet northeast of the road leading from Landrum, S. C., to Tyron, N. C., and about 700 feet northeast of the Spartanburg and Asheville Railroad. It is on the North Carolina and South Carolina boundary line, and is marked by a large stone marked N. C. on the north side and S. C. on the south side. This stone also marks the boundary between the counties of Spartanburg and Greenville.

Spartanburg County, Flint Rock, 1896.—The station is on the crest of the ridge immediately south of the Gap Creek road. It is about 50 yards to the eastward of a small blacksmith shop belonging to Mr. "Bill" Farmer, whose house is west of the shop. This small shop is directly on the line marked as the county boundary in 1896 by the Greenville surveyor. The locality called "Gap Creek Stone" or "Old Flint Rock" is on the north side of the road.

Spartanburg County, Gold Mine, 1896.—The station is between Gowensville and Greers, and nearly on the line between Spartanburg and Greenville counties, South Carolina, being 8 meters west of a stake left by the Greenville surveyor in March, 1896. This land belongs to the McBee family, whose agent, Mr. Steele, lives in the house a little east of station. The gold mine from which the name is derived is a short distance south of the station.

Spartanburg County, Gowensville, 1896.—The station is on the south side of the road leading from the village of Gowensville, S. C., to Campbell and Spartanburg, and is about 750 meters east of Gowensville. It is marked by a square stone post placed there to mark the county boundary, and it is 36 meters west of the so-called "old boundary," at the forks of the road, where there is an old stone.

Spartanburg County, Green, 1896.—The station is about 2 miles south of Pelham bridge and near the old Indian boundary line, being a little west of that line and a little east of the road, and on land belonging to Luce Green.

Spartanburg County, Greers, 1896.—The station is in the eastern part of Greers, S. C., and just on the Spartanburg side of the "old county line," which is here marked by a lane, said to have been laid out equally on each side of the boundary. The line marked by the Greenville surveyor in 1896 lies a little farther west. The station is in the yard of Mr. Wyatt, who keeps an inn here. It is west of the house and between it and the lane, near the fence.

Spartanburg County, Pelham, 1896.—The station is on the west side of the road leading from Greers to Pelham, and is on the outskirts of the latter village. It is about a quarter of a mile north of Pelham bridge, on the summit of the ridge overlooking the factory and surroundings. The station is marked by a square stone post, placed there by the Greenville surveyor to mark the boundary line.

Spartanburg County, Spartanburg, 1896.—The station is on the campus of the Wofford College, in front of the main building. It is 67.25 meters nearly south from the Coast and Geodetic Survey primary triangulation station "Wofford," on the roof of the college building. The magnetic station is marked by a stone post about 6 inches square, with its upper surface just above the ground. On this surface are cut the letters U. S. C. S., also M. S.

Spartanburg County, Talent, 1896.—The station is on the farm of Mr. B. S. Talent, about 1 mile north of Earle's mill, on the road from Gowensville to Landrum, S. C. It is west of the road and just south of a clump of woods opposite Mr. Talent's house, and on the county line as marked at the time.

SOUTH DAKOTA.

Beadle County, Huron, 1900.—The station is the south stone of the meridian line in the court-house grounds, near the south fence.

Brown County, Aberdeen, 1896.—Observations were made over the center of a pine stub located in the Brown County court-house grounds. It is distant 195.2 feet northeast of the northeast corner of the court-house building, 198.1 feet east of the east side of North Main street, 47.1 feet south of the east and west plank walk. The court-house building is a wooden structure, and is on the east side of North Main street, three blocks north of the C., M. & St. P. passenger station. The point used as a mark or range bears 73° 32′.9 east of true north.

Codington County, Watertown, 1900.—The station is in the southeast corner of the court-house yard, 5 feet from the south wooden fence and 6½ feet from the east wooden fence. It is marked by a post of pipe stone of cross section 4½ by 3¼ inches, lettered on top U. S. C. & G. S. The mark or range used was the southeast corner of the Goss Opera House, and bears 30° 16′.8 east of true north.

Davison County, Mitchell, 1896.—Observations were made over the center of a pine post located in the grounds of the Dakota Methodist University. It is distant 206 feet west of the west side of the university building, and 12 feet north of the edge of the road which runs in front of the university building. The Dakota University is on a high ridge about one-half mile south of the Mitchell High School, on the south side of the town about one-half mile south of the C., M. & St. Paul passenger station. The central point of the Mitchell High School was used as a mark or range. This mark or range bears 6° 02′.2 east of true south. The central point of the court-house bears 11° 05′.8 west of true south.

Hughes County, Pierre, 1896.—Observations were made over a point in the northwest corner of the Hughes County court-house yard at Pierre. It is distant 100.7 feet north of the northwest corner of the court-house building, 23.4 feet from the wooden fence on the northwest side of the yard, and 166 feet north of the permanent bench mark No. — of the Missouri River Commission. The court-house is on the hills overlooking the main portion of the city.

Minnehaha County, Sioux Falls, 1900.—The station is the astronomical pier on the grounds of the post-office building. The mark or range used was the northeast corner of the opera house and bears 24° 10′.8 west of true north.

Potter County, Gettysburg, 1900.—The station is in the court-house yard, 4 feet south of the south side of the court-house extended and 108.5 feet east of the east side of the court-house extended. It is marked by a stub.

Spink County, Redfield, 1900.—The station is in the court-house yard just east of the building. It is about 82 feet east of the court-house and about 150 feet south of the front fence. The exact spot is over a small drill hole in a bowlder which crops out of the ground at this point. The mark or range used was the southeast corner of the first story of the Kerner House, just visible to the right of the church across the road and bears 6° 54′.5 east of true north.

Yankton County, Yankton, 1896.—Observations were made over the center of a lynn wood post. This post was located in the grounds of the Yankton Congregational College of 1881. It is distant 254.9 feet north of the north entrance to the main college building and 45 feet east of the nearest edge of the walk of the Capital street entrance to the college grounds. The mark or range used was the tank pinnacle of the city water storage tank. This mark or range bears 57° 45′.7 west of true south.

TENNESSEE.

Campbell County, Careyville, 1900.—Observations were made over an oak peg in the lot in the northwest corner of the first crossroads east of the railroad station, about 500 feet from the railroad. This peg is distant 48 feet north and 44 feet west of the fence surrounding this lot, in which observations were also made in 1881. The mark or range used was the west gable of a small house at the foot of the hill near the turn in the road. This mark or range bears 97° 32′.4 east of true south.

Davidson County, Nashville, 1888.—The station is in the southwest section of land formed by the two intersecting gravel roads in front of the central building of the Vanderbilt University. It is 11.5 yards from the edge of the road leading to the central building and 21.5 yards from the road crossing this road. It is marked by a locust post sunk flush with the surface of the ground.

TENNESSEE —Continued.

Hamilton County, Chattanooga, 1900.—Observations were made over the center of the limestone post located in the grounds of the Stanton House, 17 feet from the south fence and 30½ feet from the east fence of these grounds. The same point has been used before for secular variation observations. The mark or range used was the rear of a brick building showing between two frame houses. This mark or range bears 14° 41′.1 east of true south.

Knox County, Knoxville, 1900.—Observations were made over the center of a stone post located in the grounds of the University of Tennessee, west of the agricultural building and greenhouse, very nearly in line between the west end of the greenhouse and a wild cherry tree, about 50 feet from the cherry tree and 15 feet from the edge of the terrace. Observations were also made over this post in 1890. The mark or range used was the northwest corner of a one-story hip-roof house on the far side of the river. This mark or range bears 12° 39′.4 east of true south.

Shelby County, Memphis, 1901.—The station is located in the southwestern corner of the United States Marine Hospital grounds, 33 feet from the upper edge of the terrace, which marks the southern boundary of the grounds, and 52.3 feet from the west fence. It is marked by a sandstone post, 6 by 6 inches on the top, sunk flush with the surface of the ground. The mark or range used was the flagstaff on the Marine Hospital building, and bears 87° 33′.9 east of true south.

Unicoi County, Bug Butt, 1893.—The station is on the Tennessee-North Carolina line, about 20 miles southeast of Greeneville, and is 15 miles south of Fullens. It is marked by a large heavy rock set flush with the surface of the ground, with drill hole, intersecting grooves, and letters U. S. C. S. cut on it.

Wilson County, Lebanon, 1898.—The station is 1524 meters northwest from the square at Lebanon, on a small elevation, 393 meters north of the Nashville pike, on the property of W. H. Brown. It is the north end of a measured base, and is marked by a stone monument 2 feet 9 inches high, and 1 foot 6 inches square, resting on a base, 2 feet 9 inches square.

TEXAS.

Bandera County, Bandera, 1901.—The station is near the north corner of the public school yard and is marked by a white limestone post 6 inches square, lettered U. S. C. & G. S., projecting about 2 inches above the surface of the ground. A drill hole in this post marks the north end of a meridian line 363 feet long, the south end of which is marked by a limestone post 6 by 8 inches, buried 1 inch below the surface of the ground. This stone is near the south corner of the schoolhouse yard. The mark or range used was a church spire, and bears 6° 33′.6 east of true south.

Baylor County, Seymour, 1900.—Observations were made over a stone post 6 by 6 inches on the top and 3 feet long, set 32 inches in the ground. The top of this post is lettered U. S. C. & G. S., with a hole in the center of it. The center of this hole marks the point. It is located on the vacant lot west of the C. C. Milling Company's plant, and south of the Baptist church. It is placed approximately in line with the extreme west wall of this church. It is distant 305.8, 291.5, and 233 feet, respectively, from the southwest corner of this church, from the northeast corner of a picket fence west of this stone post, and from the northwest corner of the plank fence around the square southeast of the square occupied by the stone post. The mark or range used was the north ridge of a small, distant house, nearly magnetic south of the post. This mark or range bears 5° 31′.8 west of true south. The north steeple of the Baptist church bears 6° 34′.8 east of true north. The spire on the stone hotel bears 39° 19′.7 east of true north. In 1901 a meridian line 382.1 feet long was established, the south end of which is a few feet from the southwest corner of the square east from magnetic station, and the north end near the southwest corner of the square east from Baptist church. Each end is marked by a limestone rock about 12 inches square, lettered U. S. C. & G. S. S. M. (or N. M.) on top.

Bee County, Beeville, 1890.—The station is in the northeast corner of the court-house grounds and is marked by a mesquite post sunk flush with the surface of the ground. This post is distant 68 feet from the north fence and 49 feet from the east fence. The south rod on the Ellis Hotel bears 87° 40′.0 west of true north.

Bell County, Belton, 1901.—The station is on the campus of Baylor College, near the south fence and in front of President Wilson's cottage. It is marked by a white limestone post 6 inches square at

TEXAS—Continued.

the top, lettered U. S. C. & G. S., projecting 2 inches above the surface of the ground. A drill hole in this stone marks the station and the south end of a meridian line 580 feet long. The north end of this line is in the northwest corner of the campus, and is marked in a similar manner. The mark or range used was the middle of a chimney at the west end of a house on a ridge distant about 2 miles, and bears 22° 37′.0 west of true south.

Bexar County, San Antonio, 1889–1895.—The magnetic observatory established at San Antonio in 1889 was on the military reservation, about 300 feet northwest of the hospital. Two small buildings were provided for absolute observations. In 1892 it became necessary to change the location and a new site was chosen, on Hillside Ranch, about 5 miles northwest of the old site, the absolute declination pier being 136 meters southwest of the center chimney of the house of J. M. Vance. The mark or range was a cross painted on the southwest chimney of Vance's house, and bore 73° 38′.2 east of north.

Bowie County, Texarkana, 1901.—The station is about 1 mile from the town, in the grounds of Major Allen, on State Line avenue. It is in a large open field north of Major Allen's house, and about 600 feet from the State line and about 700 feet from the fence around the house and barn. It is marked by a stone post 8 inches square set so as to leave about 2 inches project above the surface of the ground. The mark or range used was the cross on the Catholic church, and bears 3° 30′.6 west of true south.

Brazoria County, Columbia, 1890.—The station is in the open lot in the rear of the Presbyterian church, on Main street, adjoining Harris Hotel. It is marked by a live-oak post 2 feet long, sunk flush with the surface of the ground. The post is distant 47.9 feet from the rear of the church, 23.3 feet from the north fence of the lot, and 31 feet from the west fence of the lot (running parallel to Main street).

Brewster County, Alpine, 1901.—Observations were made over the south stone of the meridian line established on the court-house grounds. This stone is 73.3 feet from the southeast corner and 99.3 feet from the northeast corner of the court-house. The mark or range used was the spire of the water tower of the Southern Pacific Railroad. This mark or range bears 28° 02′.6 east of true south. The Baptist church spire bears 52° 26′.4 east of true north.

Buchel County, Marathon, 1902.—Observations were made in the public square near the pubiic schoolhouse. The precise point is near the southwest corner of the square, and is 9.6 feet from the North Second street fence line and 12.8 feet from the avenue D fence line. The mark or range used was the west corner of the roof of the railroad station. This mark or range bears 28° 06′.0 west of true south. The northwest corner of the schoolhouse bears 46° 52′.0 east of true north. The southeast corner of the schoolhouse bears 58° 08′.0 east of true north.

Calhoun County, Port Lavaca, 1890.—The station is in the north corner of the court-house square. It is marked by a red-cedar post sunk flush with the surface of the ground. This post is 12.5 feet from the northeast fence around court-house yard, 46.7 feet from the north corner of the small wooden building between the court-house and the jail, and 77 feet from the corner of the jail.

Clay County, Henrietta, 1900.—Observations were made over a tack in a stake driven flush with the ground. This stake was located in the southwest corner of the grounds of the brick public-school building, distant 153.5, 73.9, and 89.8 feet, respectively, from the eastern, from the southern, and from the western fence lines of this school property. It is also distant 268.6 feet from the southwest corner of the school building, a little west of the extreme western side of the school building prolonged. The mark or range used was the tip of the western ridge of the brick house of Mr. Gowan, and bears 14° 13′.7 east of true south.

Coke County, Robert Lee, 1901.—The station is near the northwest corner of the court-house square, 12 feet from the north fence and 20.3 feet from the north end of a meridian line 305.3 feet long. This north end is marked by a gray sandstone, 7 by 9 inches, lettered U. S. C. & G. S. on the top. The south end is marked by a similar stone, 7 by 10 inches, on top. Each projects about 4 inches above the surface of the ground.

Coleman County, Coleman, 1901.—The station is near the northwest corner of the public school grounds, and is marked by a gray limestone, 6 by 9 inches, buried flush with the ground and lettered U. S. C. & G. S. on top. Due north of this stone and 281.66 feet distant another stone similarly marked was set to mark the true meridian.

TEXAS - Continued.

Cooke County, Gainesville, 1900.—Observations were made over a copper tack, in a stake driven flush with the ground. This stake was located on the girls' side of the grounds of the South Side Public School, between Denton street on the west side, Lindsay street on the east side, Gordon street on the south side, and an unnamed street on the north side of the public-school grounds. It is distant 112.2 and 135.6 feet, respectively, from the northwest and the northeast corners of the South Side brick school building, in the line of the schoolhouse tower, east of south, and the pump house of the waterworks, west of north of this stake. The mark or range used was the northeast corner of the tower of the residence belonging to Dr. A. S. Scott. This mark or range bears 1° 22′.9 east of true south.

Concho County, Paint Rock, 1901.—The station is near the southwest corner of the public-school lot, 160.87 feet from the northwest corner and 139.48 feet from the southwest corner of the school building. It is marked by a blue limestone post, 5 by 8 inches on top, lettered U. S. C. & G. S., sunk flush with the surface of the ground. A drill hole in the stone marks the exact point, and also the south end of a meridian line 417.5 feet long, the north end of which is marked by a similar stone, 4 by 5 inches on top, and similarly lettered.

Crocket County, Ozona, 1901.—The station is in the town park, near the east side, 17.2 feet from the north fence. It is marked by a hard limestone post, 9½ inches square, projecting 3 inches above the surface of the ground, and lettered on top U. S. C. & G. S. A drill hole in this stone marks the exact point, and the north end of a meridian line 378 feet long. The south end of this line is marked in a similar manner. The mark or range used was the center pole of the town reservoir, and bears 83° 33′.7 east of true north.

Dewitt County, Cuero, 1901.—The station is near the northwest corner of the high-school grounds, 37.8 feet from the north fence and 75.5 feet from the west fence. It is marked by a limestone post, 8 inches square on top, projecting 3 inches above ground and lettered U. S. C. & G. S., N. M. A similar stone, 253.1 feet due south, marks the south end of the meridian line. The mark or range was the spire of the German Lutheran church, and bears 81° 14′.2 west of true north.

Dewitt County, Lindenau, 1901.—The station is about a quarter of a mile east of the post-office in the open prairie southeast of the house of Charles Wild, and a little west of a clump of live oak trees. It is marked by a limestone post, 4 by 12 inches, on top, lettered U. S. C. S., 1901, and projecting 3 inches above ground. The mark or range used was the spire of the court-house at Cuero, 5.9 miles distant, and bears 61° 06′.7 east of true south. The south rod on Mr. Wild's residence bears 81° 48′.6. west of true north.

Dickens County, Dickens, 1901.—The station is near the middle of what is expected to be the sidewalk on the south side of the first street south and the east side of the first street west of the court-house. A meridian line, 289.6 feet long, was marked by two granite posts near the northeast and southeast corners of the court-house square. These stones are 7 inches square on top, project 3½ inches above ground, and are lettered U. S. C. & G. S., S. M. (or N. M.).

Dimmit County, Carrizo Springs, 1901.—Observations were made over the south stone of the meridian line established on the court-house grounds. This stone is 17.5 feet from the southwest corner and 49.3 feet from the southeast corner of the court-house. The north stone is near the northwest corner of the grounds, 4 feet from the north fence. From the south stone the Baptist church spire bears 58° 43′.0 west of true north.

Duval County, Peña, 1890.—The station is in the open plain due north of the western edge of the railroad station. It is marked by a heavy mesquite post, projecting 6 inches above ground. The post is 225 feet from the northwest corner of the railroad station and 95 feet west of the northwest corner of the fence around a garden. The south rod on the Pena Hotel bears 65° 08′.0 east of true south.

Duval County, San Diego, 1890.—The station is in the northwest corner of the court-house grounds, and is marked by a mesquite post sunk flush with the surface of the ground. This post is 10 feet from the north fence and 9 feet from the west fence around the court-house square. It is also distant 61.8 feet from the northwest corner of the wooden court-house building. The cross on the Catholic church bears 31° 40′.0 west of true south. The spire of the Methodist church bears 41° 07′.0 west of true south.

TEXAS—Continued.

Eastland County, Cisco, 1888.—The station is in the open lot west of the Wilson Hotel, on Sixth street, where avenue F, if extended, would intersect it. It is marked by the center of a flint rock, 4 inches square, sunk flush with the surface of the ground. This stone is 32 feet from the intersection of the northern edge of Sixth street and the western edge of avenue F. It is 113 feet from the foundation of the Wilson Hotel. The mark or range used was the rod on the Presbyterian church, and bears 7° 40′.9 east of true south. The Baptist church spire bears 48° 22′.0 east of true south.

Edwards County, Rock Springs, 1901.—The station is in the public school lot, 23.8 feet from the northeast corner and 42.7 feet from the southeast corner of the northern part of the building. It was temporarily marked by a small wooden peg, and is 119.1 feet from the south end of a meridian line passing through the station, and 387.2 feet long. Both ends of this line are marked by white limestone posts, 7 by 9 inches, buried nearly flush with the surface of the ground and lettered U. S. C. & G. S., with drill holes marking the exact points.

El Paso County, Boundary, 1892.—The station is one used by the boundary commission and is on the east side of the Rio Grande, on the hill between the Atchison, Topeka and Santa Fe and Southern Pacific railroads, and also in the prolongation of the boundary line. It is about 3 miles from El Paso.

El Paso County, El Paso, 1895.—The station is located in the city park, 100 feet west of the longitude pier. It is about in the center of the square bounded by Missouri, Santa Fe, Franklin, and El Paso streets.

El Paso County, Sierra Blanca, 1888.—The station is in the open plain north of the depot hotel and railway station. It is between the Texas and Pacific Railroad track and the wooden corral north of the hotel. It is marked by a red wood post sunk flush with the surface of the ground. This post is 204½ feet from the north edge of the north wall of the hotel and 32½ feet from the south fence of the corral. The central cupola of the hotel bears 21° 25′.0 west of true south.

El Paso County, Kent, 1902.—The magnetic station is in the rear of the Texas and Pacific Railroad station, 14 feet from the fence, 18 feet from the west side of a gateway in the fence, and 133.8 feet from the southwest corner of the station. It is marked by a post projecting 3 inches above ground. The southwest corner of the railroad station bears 25° 41′.0 west of true north.

Erath County, Stephenville, 1901.—The station is in the southwest corner of the public school grounds, about 20 feet from the south fence. It is marked by a white limestone post 6 inches square, lettered on top U. S. C. & G. S., projecting 5 inches above the surface of the ground. A drill hole in this post marks the exact point, and also the south end of a meridian line 500 feet long. The north end of this line is marked in a similar manner. The mark or range used was the tip of the court-house tower, and bears 50° 55′.4 east of true north.

Fayette County, Lagrange, 1890.—The station is in the southwest corner of the court-house square. It is marked by a drill hole in the top of a sandstone post, sunk flush with the surface of the ground. Due north of this post, and near the edge of the court-house building, another stone was set, thus forming a true north and south line. The south stone of this meridian line is distant 40.3 feet from the fence along Main street and 36.5 feet from the fence along Travis street. The rod on the cupola of the Masonic Lodge bears 76° 01′ west of true south.

Fisher County, Roby, 1901.—The station is 74.6 feet nearly east from the southeast corner of the court-house and 104.23 feet north from the south end of a meridian line 278.9 feet long. Two mesquite posts about 5 inches square on top were set flush with the surface of the ground, with a nail in the top to mark the true meridian.

Frio County, Pearsall, 1901.—Observations were made at the north stone of the meridian line established on the court-house grounds. The stone is in line with the north face of the court-house and 37 feet from the northeast corner. The south stone is at the south edge of the court-house grounds. From the north stone the windmill of Magus Smith bears 19° 49′ west of true south.

Galveston County, Galveston, 1895.—The station is located at the southeast corner of Seventeenth and One-half streets.

Gillespie County, Fredericksburg, 1901.—The station is located in the public school grounds, 47.55 feet from the southeast corner and 60.46 feet from the northeast corner of the school building, and is

TEXAS—Continued.

marked by a red granite post 7 by 7½ inches, lettered U. S. C. & G. S., buried about 1 inch below the surface of the ground. A drill hole in this post marks the north end of a meridian line 456.5 feet long, the south end of which is similarly marked, except that the post projects 2 inches above the surface of the ground. This south stone is near the electric light plant, 6.14 feet from the fence.

Glasscock County, Garden City, 1901.—The station is near the south side of the court-house square, 26 feet from the fence and 10.7 feet from the south end of a meridian line 293.3 feet long. The stones to mark the meridian line were set by the county judge. The south stone is 15.6 feet from the fence and the north stone 11.25 feet from the fence.

Gonzales County, Gonzales, 1901.—The station is near the center of the high school campus, 134 feet from the north fence and 241 feet from the school building. It is marked by a block of sandstone 7 by 8 inches on top, set flush with the surface of the ground, and lettered U. S. C. S. The mark or range used was the spire of the Negro Baptist church, and bears 12° 38′.6 east of true north. The tallest spire of the brick Methodist church bears 73° 47′.2 west of true south. A meridian line was established by the United States Geological Survey on the court-house square, but the location is not suited for magnetic observations.

Hall County, Memphis, 1900.—Observations were made over a tack in a stake driven flush with the ground. This stake was located in the grounds adjacent to the Presbyterian church, distant 79.6 feet from the southwest corner of this church building and 60 feet from the middle of the three southeast corners of this building. It is distant 75 feet from the center of the road east of these grounds, and 14 feet east of the extreme eastern wall of the Presbyterian church when prolonged, and is about in the line joining the jail building with the windmill of W. A. Johnson. The mark or range was the eastern edge of the brick chimney of Mr. W. M. Pardue's residence. This mark or range bears 4° 48′.2 east of true south.

Harris County, Houston, 1890.—The station is in the large open space north of the old exposition building in the fair grounds. It is marked by a pine post 2 feet long sunk flush with the surface of the ground. This post is 198.5 feet from the plank walk leading to the entrance of the fair grounds, and 171 feet from the walk leading from the front of the old exposition building. The center of the cupola of the large brick house of A. W. Johnson bears 45° 49′ east of true north.

Haskell County, Haskell, 1901.—The station is at the northwest corner of the second square east of the court-house, opposite Johnson's livery stables. It is 6.69 feet west and 0.25 foot south of the south end of a meridian line 383.1 feet long. The south end is marked by a hard limestone post 7 by 9 inches on top, lettered U. S. C. & G. S. S. M. The north stone is 7 inches square and lettered U. S. C. & G. S.

Howard County, Big Springs, 1901.—The station is on the north side of the court-house square, 124 feet from the fence and 37.1 feet from the north end of a meridian line 307 feet long. This meridian line is marked by hard limestone posts 7 inches square, lettered U. S. C. & G. S. on top and set flush with the surface of the ground.

Irion County, Sherwood, 1901.—The station is near the southeast corner of the court-house square, 8.4 feet from the south fence. It is marked by a white limestone post 6 inches square, projecting 2 inches above the surface of the ground, and lettered on top U. S. C. & G. S. A drill hole in this post marks the exact point and the south end of a meridian line 267.2 feet long. The north end is marked by a stone post 10 inches square, similarly lettered and buried flush with the surface of the ground. The Baptist church spire bears 48° 23′.0 east of true south. The Methodist church spire bears 68° 26′ west of true north.

Jack County, Jacksboro, 1901.—The station is near the middle of the sidewalk on the east side of the street east of the court-house, about 110 feet from the jail. It is 0.45 foot west of the south end of a meridian line 551 8 feet long, the north end of the line being nearly opposite the court-house. The ends of the meridian line are marked by limestone posts 7 inches square, set flush with the sidewalk, and lettered U. S. C. & G. S. S. M. (or N. M.).

Jackson County, Edna, 1901.—The station is on the court-house square, 21 feet from the north fence, opposite the jail. It is marked by a post of concrete rock about 8 inches square, pyramidal on top, and projecting about 9 inches out of ground. A similar stone is placed 129.5 feet due south near the site of the old court-house. The mark or range used was the east edge of the chimney of the Southern Pacific Railroad depot, and bears 22°. 05′.1 east of true south.

TEXAS—Continued.

Jefferson County, Beaumont, 1890.—The station is in the southeast corner of the court-house square, distant 105 feet and 61.3 feet, respectively, from the fences along Pearl and Franklin streets. It is marked by a yellow-pine post 2 feet long, sunk flush with the surface of the ground. The spire on the cupola of Mr. Carroll's large brick house bears 32° 32′ east of true south.

Jones County, Anson, 1901.—The station is east of the public school building, 61 feet from the southeast corner, and 41.4 feet from the northeast corner, and 144.1 feet from the south end of a meridian line 278.6 feet long. The south end of the meridian line is marked by a limestone 8 by 9 inches on top, set flush with the surface of the ground, and lettered U. S. C. & G. S. S. M. The north end is marked similarly by a stone 10 by 12 inches on top.

Karnes County, Karnes City, 1901.—The station is near the northeast corner of the court-house square, 35 feet from the north fence, 25.6 feet from the east fence, and about 123 feet from the court-house. It is marked by a limestone post 8 inches square on top, projecting 3 or 4 inches above ground, and lettered U. S. C. & G. M. S. M. The south stone of the meridian line is 215.9 feet distant in the southeast corner of the square. The mark or range used was the flag pole on the brick schoolhouse, about 4 blocks away, and bears 64° 33′.4 east of true north.

Kaufman County, Kaufman, 1901.—The station is at the north end of the public school grounds, 53.7 feet from the north fence and 116.1 feet from the west fence. It is marked by a gray sandstone post 6 inches square, lettered on top U. S. C. & G. S., sunk flush with the surface of the ground. A drill hole in the post marks the exact point and the north end of a meridian line 401.1 feet long. The south end is marked in a similar manner. The mark or range used was the center of the ball on the Baptist church spire, and bears 20° 00′.6 west of true north.

Kent County, Clairemont, 1901.—The station is 148.95 feet from the southeast corner and 151.9 feet from the northeast corner of the court-house. A meridian line 317.6 feet long was established and marked by two limestone posts 5 by 6 inches on top, lettered U. S. C. & G. S., and set flush with the ground. The south stone is 128.45 feet from the magnetic station. The north stone is on the north side of the street north of the court-house and near the building line.

Kerr County, Kerrville, 1901.—The station is in the court-house grounds, about 60 feet from the northeast corner of the building. It is marked by a white limestone post about 8 inches square, lettered U. S. C. & G. S., and sunk nearly flush with the surface of the ground. A drill hole in this post marks the south end of a meridian line 430 feet long, the north end of which is similarly marked.

Kimble County, Junction City, 1901.—The station is on the north side of the court-house square, about 20 feet west of the north entrance to the grounds and about 15 feet from the fence. It is marked by a white limestone post 5½ by 9 inches, lettered on top U. S. C. & G. S. A drill hole in this post marks the north end of a meridian line 240.9 feet long. The south end of this line is marked by a similar stone 6 inches square, similarly lettered.

King County, Guthrie, 1901.—The station is near the southwest corner of the court-house square, 72.73 feet from the south end of a meridian line 800.3 feet long. The meridian line is marked by two limestone posts 6 by 8 inches on top and lettered U. S. C. & G. S. S. M. (or N. M.).

Kinney County, Spofford, 1890.—The station is in the open lot in the rear of the building used as a post-office, which is situated on the street facing the railroad. It is marked by a redwood post sunk flush with the surface of the ground. The post is 64.4 feet from the north side of the post-office building and 40 feet from the east fence around the yard of the stage office.

Kinney County, Brackettville, 1901.—The magnetic station is just inside the Government reservation and 33 feet east of the board walk leading from Ann street to the parade ground. It is marked by a stone post which forms the north end of a meridian line established at the time of these observations. The mark or range used was the west corner of the west chimney of the quartermaster's storehouse, and bears 6° 21′.5 east of true south.

Knox County, Benjamin, 1901.—The station is near the northeast corner of the court-house square, 114.2 feet from the north end of a meridian line 401.15 feet long. The north end of the meridian line is marked by a sandstone post 7 by 9 inches on top and lettered U. S. C. & G. S. N. M. The south end is marked by a sandstone 8 by 10 inches on top and lettered U. S. C. & G. S. S. M. This stone is 5.93 feet from an iron pipe driven in the ground to mark the original corner of the court-house square. Due north of this pipe and 6.27 feet from the north meridian stone is an iron pin in a cement stone, planted some years ago by a local surveyor.

TEXAS—Continued.

Lampasas County, Lampasas, 1901.—The station is the triangulation station, Lampasas Southwest Base, located on the brow of a prominent hill about 4 miles south of Lampasas. It is about a mile west of the Lampasas and Austin road, in what is known as the Craft pasture. The exact point is the center of the brass plate in the capstone. The mark or range was the Baptist church spire at Lampasas, and bears 10° 46′.2 west of true north.

Lasalle County, Cotulla, 1901.—The station of 1890 was reoccupied. It is marked by a marble post projecting a few inches above ground. The stone is 146.8, 92.5, and 113.3 feet, respectively, from the west, south, and east corners of the court-house. The spire of the Presbyterian church bears 64° 55′ east of true south.

Lavaca County, Hallettsville, 1901.—The station is in a small pasture belonging to John Buchanan, county clerk, about 50 yards south of his residence and 74 feet east of a lane leading from it toward town. A true meridian line 284.9 feet long is marked by two limestones, 8 inches square on top, projecting 3 inches above ground, and lettered U. S. C. & G. M. N. M. The north stone also marks the magnetic station. The mark or range used was the central spire of the court-house, and bears 1° 19′.0 west of true south. The spire of the Catholic church bears 10° 35′.0 east of true south.

Liberty County, Liberty, 1890.—The station is in the northeast corner of the court-house square. It is marked by a cypress post sunk flush with the surface of the ground. This post is 37.8 feet from the north fence and 65.4 feet from the east fence around the court-house square. The mark or range used was the pole on the railway station, and bears 6° 25′ east of true south. The spire of the Catholic church bears 71° 26′ west of true south.

Limestone County, Groesbeck, 1901.—The station is in the grounds of the public school 100 feet and 70.7 feet, respectively, from the northwest and the northeast corners of the school building. It is marked by an oak post sunk 2 inches below the surface of the ground. The mark or range used was the tip of the court-house tower, and bears 23° 35′.0 east of true south.

Llano County, Llano, 1901.—The station is in the southwest corner of the public-school lot, 13.2 feet from the south fence and 18.1 feet from the west fence. It is marked by a dark sandstone post, 6 by 9 inches, lettered U. S. C. & G. S., projecting about 3 inches above the ground. A drill hole in this stone marks the exact point and also the south end of a meridian line 248 feet long, the north end of which is similarly marked. The range or mark used was the spire of the Christian church, and bears 3° 56′.0 west of true north.

Mason County, Mason, 1901.—The station is in the court-house square about 14 feet west and 60 feet north of the northwest corner of the court-house. It is marked by a sandstone post 7½ inches square, projecting about 4 inches above the ground, and lettered U. S. C. & G. S. A drill hole in this stone marks the exact point and also the north end of a meridian line 371.7 feet long, the south end of which is on the west side of the north entrance to the jail and is similarly marked. The mark or range used was a telegraph pole on a hill, and bears 4° 02′.0 west of true south.

Maverick County, Eagle Pass, 1901.—Observations were made at the north stone of a meridian line about 500 feet long established in the open space south of the executive building of Old Fort Duncan. This station was previously occupied in 1890. The mark or range used was the west edge of the west chimney on officer's quarters No. 4. This mark or range bears 0° 10′ east of true south.

Medina County, Hondo, 1901.—A meridian line was established on the east side of the court-house square. The south stone is 23 feet from the east fence and 25.8 feet from the south fence. The north stone is 15.5 feet from the north fence and 9.5 feet from the east fence. Observations were made at the south stone. The mark or range used was the spire on the Baptist church, and bears 4° 41′ east of true south.

Menard County, Menardville, 1901.—The station is 27.75 feet from the northwest corner and 43.75 feet from the southwest corner of the court-house. It is 23 inches west of the north end of a meridian line 318.5 feet long. The meridian line is marked by two white limestones 9½ inches square on top, projecting 2 inches above ground, and lettered U. S. C. & G. S.

McCulloch County, Brady, 1901.—A meridian line 555.5 feet long was established on the west side of the second street west of the court-house. The south end of this line is in front of Mr. W. P. Doyt's house, and is marked by a limestone post 10 by 11 inches, projecting 4 inches above the ground, and

TEXAS—Continued.

lettered U. S. C. & G. S. The north end of the line is marked by a similar stone 10 by 10 inches sunk flush with the surface of the ground. The magnetic station is 8 feet east and 14.1 feet south of the drill hole in the south meridian stone, and is at the south end of a section line.

Mitchell County, Colorado, 1900.—Observations were made over a copper tack in a cedar post 5½ by 7 inches on top and 3 feet long, set 31 inches in the ground. It is located in the court-house yard in the rear of the jail. It is distant 171.2 feet from the southwest corner of the brick court-house building. It is also distant 87.5, 66.1, and 93.3 feet, respectively, from the south and west plank fences around the court-house square, and from the south tall board fence around the county jail. The mark or range used was the top part of a distant post in a fence. This mark or range bears 9° 07′.6 west of true south. The south cupola of the court-house bears 69° 37′.5 east of true north. The spire of the Methodist church bears 88° 44′.8 east of true north.

Mitchell County, Colorado, 1901.—The station is on the south side of the court-house square near the middle, 13 feet from the fence. It is 0.45 foot from the south end of a meridian line 257.2 feet long. The ends of this meridian line are marked by two cement stones 7 inches square on top with a drill hole near the center. The north stone is 10.65 feet from the north fence.

Nueces County, Corpus Christi, 1890.—The station is located in the open space at the foot of Lawrence street, near the intersection of Lawrence and Water streets. It is marked by a wooden post sunk flush with the surface of the ground. This post is 29 feet from the north line of Lawrence street and 22 feet from the east line of Water street. The flag pole on the custom-house bears 63° 41′ west of true north.

Orange County, Orange, 1890.—The station is in the open space in front of the Curry Hotel, at the intersection of Fifth and Elm streets. It is marked by a yellow pine post 2 feet long, sunk flush with the surface of the ground. This post is distant 31.9 feet from the corner of the fence on the northeast corner of Fifth and Elm streets, and 21.5 feet from the corner of the fence on the northwest corner of Fifth and Elm streets. The cross on the Episcopal church bears 25° 53′ east of true south.

Palo Pinto County, Mineral Wells, 1901.—The station is on the east side of the public school grounds, nearly in line with the south end of the new school building. It is marked by an oak tent peg. The station is 12 feet from an oak tree nearly north, 42.4 feet from an oak tree nearly northwest, and 21.8 feet from an oak tree about south 25° west. The mark or range used was the cupola on Mr. H. C. Herndon's house, and bears 5° 49′.1 west of true south. The north spire on the Baptist church bears 42° 02′ east of true south.

Palo Pinto County, Palo Pinto, 1901.—The station is on the grounds of the public school, southeast of the school building, and 156.2 feet from the south end of a meridian line 400.15 feet long. The south end of the meridian line is near the southeast corner of the school lot, and is marked by a sandstone 8 by 11 inches on top, set flush with the surface of the ground, and lettered U. S. C. & G. S. S. M. The north end of the meridian line is marked by a limestone 6 by 8 inches on top, and lettered U. S. C. & G. S. N. M.

Pecos County, Sanderson, 1890.—The station is on the open plain north of the eastern end of the Southern Pacific Railway station. It is marked by a redwood post sunk flush with the surface of the ground. This post is 124.2 feet from the northwest corner of the restaurant northeast of the railroad station.

Potter County, Amarillo, 1899.—Observations were made over a copper tack in a stake driven flush with the ground. This stake was located in the southwest corner of the schoolhouse grounds, distant 48.1 and 78.8 feet, respectively, from the southern and western fence lines of these schoolhouse grounds. It is also distant 108.8 and 112.3 feet, respectively, from the extreme southwest corner of the school building and from the southwest corner of the eastern wing of this building. This stake is in the line joining the schoolhouse tower and the residence of Mr. Pen, west of south of it. It is also in the line joining the Methodist church west of north and the college building east of south of the stake. The mark or range used was the southwest edge of the chimney on the residence of Mr. Woflin. This mark or range bears 27° 10′.4 west of true south.

Presidio County, Marfa, 1902.—Observations were made over a cedar post located on the court-house grounds near the southwest corner and 66.5 and 65.5 feet, respectively, from the west fence

TEXAS—Continued.

and south fence. Beneath this post is a bottle 3 feet below the surface of the ground. From this point the Christian church spire bears 52° 23′ west of true south. The cross on the Episcopal church bears 12° 14′ east of true south.

Presidio County, Valentine, 1902.—Observations were made over a mesquite stub located in the yard of Dr. D. T. Finley. It is 18.8 feet from the east fence, 41.6 feet from the south fence, and 16.3 feet from the nearest corner of the house. The precise point is marked by a nail driven in the top of the stub. Beneath this stub and 2½ feet below the surface of the ground is a bottle. The mark or range used was the post on the north gable of a tool house belonging to the Southern Pacific Railroad. This mark or range bears bears 17° 16′ west of true south. The cupola on the railroad station bears 87° 02′ west of true north.

Reeves County, Pecos City, 1901. Observations were made over the south stone of the meridian line established in the court-house yard. This stone is 78.7 feet from the southwest corner and 52.5 feet from the southeast corner of the court-house. The north stone is 238.3 feet distant, in the northeast corner of the square.

Reeves County, Guadalupe, 1902.—The magnetic station is 102.4 feet from the southwest corner of the section foreman's house, 68.5 feet from the southwest corner of the station house, and 46.6 feet from the northwest corner of the workmen's quarters. The mark or range used was the first mile-post to the west of the station and bears 54° 36′ west of true north.

Runnels County, Ballinger, 1901.—The station is near the north corner of the public-school lot, and is marked by a white limestone rock 12 by 10 by 10 inches, set about 8 inches in the ground on solid rock with Portland cement. The top of this stone is lettered U. S. C. & G. S. A drill hole marks the exact point and also the north end of a meridian line 310 feet long. The south end of this line is 85.4 feet from the east corner and 93.4 feet from the south corner of the school building, and is marked by a drill hole 2 inches deep, with letters U. S. on east and west sides cut into the bed rock 3 inches below the surface of the ground. The mark or range used was the spire of the Christian church, and bears 48° 30′.1 west of true south.

San Saba County, San Saba, 1901.—The station is near the northeast corner of the school lot, and is marked by a hard sandstone post 7 by 10 inches, projecting 4 inches above the ground, and lettered U. S. C. & G. S. A drill hole in this stone marks the exact point, and also the north end of a meridian line 491.6 feet long, the south end of which is marked by a similar stone. The mark or range used was the north gable of Mrs. W. H. Anderson's house, and bears 3° 33′.0 west of true south.

Schleicher County, Eldorado, 1901.—The station is near the southwest corner of what will probably be the court-house square. It is marked by a white limestone post 7 by 10 by 20 inches, lettered U. S. C. & G. S., buried 19 inches. A drill hole in this post marks the exact point, and also the south end of a meridian line about 700 feet long. The north end of this line is marked by a 2-foot piece of 1½-inch galvanized-iron pipe driven 23 inches into the ground. The mark or range used was the south gable of Mr. R. L. Brook's house, and bears 6° 47′.8 west of true north.

Scurry County, Snyder, 1901.—The station is on the south side of the court-house square, 15.28 feet from the fence, and is marked by a sandstone 4½ by 10 inches on top, and lettered U. S. C. & G. S. S. M. This is the south end of a meridian line 230.8 feet long. The north end is marked by a sandstone 6 by 8 inches on top, and lettered U. S. C. & G. S. N. M. Both stones are set nearly flush with the ground. The mark or range used was the south lightning rod on S. Wasson's house, and bears 72° 18′.5 east of true north. The Christian church cupola bears 73° 23′ west of true south.

Shackleford County, Albany, 1901.—The station is on the court-house square, 13.73 feet from the south fence and 59.66 feet from the west fence, and is the south end of a meridian line 352.3 feet long. The north end of the line is 15.33 feet from the north fence. Both north and south ends are marked by limestone posts 6 inches square on top and lettered U. S. C. & G. S. N. M. and U. S. C. & G. S. S. M., respectively. The mark or range used was the belfry of the public schoolhouse, and bears 21° 17′.9 east of true north. The spire of the Christian church bears 89° 21′ east of true south.

Stephens County, Breckenridge, 1901.—The station is in the northwest part of the court-house square, 125.05 feet from the northwest corner of the court-house. It is marked by a wagon spoke with a small nail in the top. The mark or range used was the spire of the Old School Presbyterian church,

TEXAS—Continued.

and bears 23° 27′.1 west of true south. The north gable of A. J. Power's law office bears 2° 32′.1 west of true south.

Sterling County, Sterling City, 1901.—The station is near the northeast corner of the court-house square, 38.5 feet from the east fence and 23 feet from the north end of a meridian line 265.8 feet long. The north end of the meridian line is marked by a white limestone 7½ by 9½ inches on top, projecting about 2 inches above ground, and lettered U. S. C. & G. S. The south end is marked by a stone 7 inches square similarly marked.

Stonewall County, Aspermont, 1900.—Observations were made over a stone post 3½ by 7 inches on top and 2.6 feet long, set 30 inches in the ground, with a cross in the center of it. The center of this cross marks the point. It is located in the court-house ground, approximately in line with the eastern wall of the court-house building, and nearly in line with the northern wall of a small frame building northwest of the court-house building.

This stone post is distant 94.6, 102.9, 126.7, and 231.4 feet, respectively, from the northeast corner and the northwest corner of the court-house building, from the northeast corner of the county clerk's office, and from the northeast corner of the small frame building. The mark or range used was the lightning rod on the residence of Mrs. Jane K. Anderson. This mark or range bears 46° 11′.8 east of true south. The top of the belfry on the schoolhouse bears 79° 42′.4 east of true south. The east gable of the Masonic hall bears 88° 38′.2 west of true south.

Stonewall County, Aspermont, 1901.—The station is on a park on the south side of court-house square, 22.26 feet due south of the south stone of a meridian line 476.4 feet long. The stone is 7 inches square on top, lettered U. S. C. & G. S., and set flush with the ground. The north stone is on a strip of ground also designated as parking, and is 7 by 9 inches on top and similarly lettered.

Sutton County, Sonora, 1901.—The station is in the southwest corner of the court-house square, 10.16 feet from the south fence and 21.88 feet from the south end of a meridian line 381.5 feet long, which is marked by white limestone posts 6 inches square at the top, 30 inches long, buried 27 inches in the ground, and lettered U. S. C. & G. S. Drill holes in these stones mark the exact points. The north stone is near the northeast corner of the court-house square.

Tarrant County, Fort Worth, 1888.—Observations were made over the center of a stone post about 4 inches square, sunk 1½ feet in the ground. This post is between East First street and Weatherford street and just east of Harding street. It is 118 feet from the fence around the yard of the old Mabu house and 74 feet 7 inches almost south of the corner of the fence around the property on Weatherford street. The mark or range used was the center of the spire on the Fort Worth Gazette office, and bears 36° 14′.5 west of true south. The center of the cupola on the First Ward schoolhouse bears 41° 25′.5 west of true south.

Throckmorton County, Throckmorton, 1901.—The station is on the public-school grounds, near the south side and southwest from the school building. A meridian line 322.75 feet long was established and marked by limestone posts 7 inches square on top, set flush with the ground and lettered U. S. C. & G. S. N. M. (or S. M.). The magnetic station is 26.27 feet north of the south stone.

Tom Green County, San Angelo, 1901.—The station is in the court-house square, 41.52 feet from the east fence and 68.99 feet from the south fence. A meridian line 242.87 feet long was established and marked by sandstone posts lettered U. S. C. & G. S. on top, set flush with the ground. The south stone is in the line of shade trees on the east side of the walk from the south gate to the court-house, 61.61 feet from the magnetic station.

Travis County, Austin, 1895.—The station is in the grounds of the State University, southeast of the main towers. It is marked with a large piece of limestone. The mark or range used was the star in the hand of the statue of Liberty on the dome of the capitol, and bears 7° 54′.0 west of true south.

Travis County, Austin 1901.—The station is in the northwest part of the grounds of the State Deaf and Dumb School. It is marked by a white limestone post, 8 inches square, lettered on top U. S. C. & G. S., with a drill hole. This post projects 3 inches above the surface of the ground and is the north end of a meridian line 570 feet long. The south end of this line is about 6 feet from the northwest corner of the laundry building and is similarly marked. The mark or range used was the middle tower on the main building of the University of Texas and bears 17° 49′.8 east of true south.

Uvalde County, Uvalde, 1901.—The magnetic station is in the southeast corner of the court-house

TEXAS—Continued.

square, 44.8 feet from the south fence and 29.6 feet from the east fence. It is marked by a stone post which is the south end of a meridian line. The north stone is 286 feet distant, in the southwest corner of the jail square, 7.5 feet from the west fence and 54 feet from the south fence. The mark or range used was the west corner of the city hall and bears 3° 52′ west of true south.

Valverde County, Langtry, 1890.—The station is on the bluff north of the Rio Grande River, and just south of the inclosure around Camp Langtry, a United States Army sub cavalry post. It is about 400 yards southeast of the railway station of the Southern Pacific Railroad. The station is marked by a cross on a limestone rock sunk flush with the surface of the ground. This stone is 90 feet from the southwest corner of the inclosure of Camp Langtry, and 96 feet from the southeast corner. The center of the cupola on the railroad eating house bears 43° 20′ west of true north.

Valverde County, Del Rio, 1901.—A meridian line was established on the west side of the court-house square and marked by stone posts. The south stone is 24 feet from the west fence and 16.5 feet from the south fence. The north stone is 45 feet from the west fence, 20.8 feet from the north fence, and 277.7 feet from the south stone. Observations were made at the south stone. The mark or range used was the southeast corner of Regan's house and bears 17° 03′ east of true north.

Victoria County, Victoria, 1901.—The station is near the south side of Memorial Square, 17.5 feet from the south fence and 63 feet from the east fence. It is marked by a limestone post 8 inches square, projecting 4 inches above ground, and lettered U. S. C. & G. S. S. M., being the south end of a meridian line 246.25 feet long. The north stone is near the the north fence of the square, and is lettered U. S. C. & G. S. N. M. The mark or range used was the spire of the negro Baptist church and bears 8° 09′.5 west of true south

Webb County, Laredo, 1890.—The station is located in the large open space northeast of the parade grounds, at Fort McIntosh. It is near the intersection of the road in front of the officers' quarters with the road leading to Laredo. It is marked by a mesquite post sunk flush with the surface of the ground. This post is 66 feet from the road leading to Laredo and 53.5 feet from the other road. It is northeast of the intersection of these roads. The mark or range used was the central post of the flagstaff, and bears 14° 24′ west of true south.

Webb County, Laredo, 1895.—The station is located 89.1 feet north and 10 feet west of the longitude station of 1895. The longitude station is located in a triangular space in Fort McIntosh, near the hospital, and near the northeast entrance. It is marked by a brick pier. From the magnetic station the court-house flagstaff bears 79° 49′.3 east of true south.

Wharton County, Wharton, 1890.—The station is located in the northeast corner of the court-house square. It is marked by a small hole drilled in a marble post 4 inches square and sunk with its top even with the surface of the ground. This post is 33 feet from the fence along Rusk street, and 38.3 feet from the fence along Milan street. The mark or range used was the west rod on Ford's Hotel, and bears 37° 05′ west of true south.

Wilbarger County, Vernon, 1900.—Observations were made over the center of a stake set in the lot adjoining the Cumberland Presbyterian church. This stake is distant 124.2, and 126.7 feet, respectively, from the southwest and northwest corners of this Presbyterian church. It is also distant 97.9, 122.7, and 92.9 feet, respectively, from the southwest and northwest corners of the fence inclosing the church lot, and from the northern fence inclosing the lot in which this stake is located. The mark or range was the lightning rod on the large house nearly south of the station. This mark or range bears 1° 45′.8 east of true south. The Methodist church spire bears 57° 50′.7 east of true north. The Christian church spire bears 66° 26′.2 east of true south.

Wood County, Mineola, 1888.—The station is in the open lot southeast of the new depot hotel, which is south of the International and Great Northern Railroad tracks. It is marked by a cedar post sunk flush with the surface of the ground. It is 74 feet from the southeast fence around the hotel and 39 feet from the fence across the alley. The Methodist church spire bears 89° 52′ west of true south. The central rod on the large railroad water tank bears 73° 42′ east of true north.

Young County, Graham, 1901.—The station is in the southeast part of the court-house square, 1.8 feet west and 45.1 feet north of the south end of a meridian line 444.8 feet long. Both ends of the meridian line are marked by sandstone posts 8 inches square, projecting about 4 inches above ground, and lettered U. S. C. & G. S. N. M. (or S. M.).

UTAH.

Beaver County, Beaver, 1895.—The station is within the inclosure around the Mormon meeting-house, 34.15 meters from the southeast corner of the meetinghouse, 13.95 meters from the Wheeler longitude station to the northwest, and 10 meters from the street fence to the east.

Beaver County, Milford, 1885.—The station is slightly southeast of the office of the justice of the peace, 25 meters from the southeast corner. It is also 100 meters from the southeast corner of Mr. J. P. Williams's house and 18 meters almost due south of a well.

Boxelder County, Promontory, 1892.—The station is 47.2 feet from the geodetic station, 39° 09′.2 west of north. The geodetic station is located on the southeasternmost summit of the promontory peninsula, a peninsula extending into Great Salt Lake from the north.

Davis County, Antelope, 1892.—The station is on Church Island, Great Salt Lake, 52.4 feet from the geodetic station on the line to promontory geodetic station, 24° 34′.7 west of north. The geodetic station is the highest point of this island, which is the largest in Salt Lake.

Davis County, Waddoup, 1892.—The station is 88 feet north and 288 feet west of the southeast corner of the northwest quarter of sec. 18, T. 2 N., R. 1 E. It is on land of T. Waddoup, and is marked by a brick pier.

Emery County, Patmos Head, 1890.—The station is 22.05 meters from the geodetic station, 7° 52′.6 west of north. The geodetic station is in a range of mountains known as the W. Tavaputs plateau; it is about 12.5 miles N. 72°.5 E. from the post-office at Sunnyside, Emery County, on the highest point in that vicinity.

Garfield County, Mount Ellen, 1891.—The station is 12.67 meters from the geodetic station a little east of the line to Patmos Head geodetic station, i. e., about 30° east of north. Mount Ellen is the northern summit of the Henry Mountains. It is a rounded, conical-shaped peak, covered with broken granite rocks. There are several lesser peaks to the north.

Grand County, Mount Waas, 1898.—The station is 43.6 feet from the geodetic station, 14° 10′.8 west of south. The geodetic station is on the highest point of the third principal prominent peak from the north end of the La Sal Mountains.

Grand County, Warner Ranch, 1893.—The station on Warner's ranch near Moab was west of his dwelling house, and about 100 feet south of an irrigation ditch near the edge of the woods.

Juab County, Mount Nebo, 1887.—The station is 51.6 meters from the geodetic station in the line to Sanpete geodetic station. The geodetic station is situated upon the southernmost summit of the mountain.

Juab County, Nephi, 1883.—The station is in the open lot across the street and northwest from the court-house. It is 236 feet 7 inches from the northeast corner of the court-house. The northeast corners of the schoolhouse and court-house are in line with the station. It is marked by an irregular stone, with a drill hole, sunk flush with the surface of the ground.

Millard County, Deseret, 1884.—The station is about 150 meters north of the railroad depot at Deseret station on the Utah Central Railroad.

Millard County, Scipio, 1884.—The station is 22.5 meters from the geodetic station, 39° 7′.5 west of north. The geodetic station is located upon the dome-like king summit of the Oak Creek range of mountains.

Piute or Beaver County, Tamarac, 1885.—No description.

Piute County, Tushar, 1885.—The station is on the line Tushar geodetic station—Mount Nebo geodetic station, 19.8 meters from the former. The geodetic station is on the northernmost of the three highest peaks in the Tushar Range, the backbone of which range forms the boundary between Piute and Beaver counties. The peak is locally known as Mount Belknap.

Sanpete County, Wasatch, 1890.—The station is 62 feet 1½ inches from the geodetic station on the line to Mount Ellen geodetic station. The geodetic station is 18 miles east of the town of Mayfield, in the range of mountains known locally as Wasatch Range. It is on a small table in the southern part of the range, there being nothing as high to the south of it, although there are one or two peaks nearly so. On the north of this table is a canyon in which a small stream runs which flows into Ferron Creek; this branch is called the south fork of Ferron Creek. On the south side of the table is Muddy Creek canyon. Station is about 4 miles due east of Baldy Peak.

UTAH—Continued.

Salt Lake County, City Creek, 1893.—The station is located on a low ridge (east and west) of the Wasatch Mountains, and is 2½ miles north of Salt Lake City. It is reached by proceeding north along the road which is the continuation of State street. It is marked by a granite post 7 inches square on top, with a copper bolt.

Salt Lake County, Salt Lake City, 1893.—The station is 23.16 feet west of the east wall and 30.6 feet north of the south wall of the Temple Block. It is also 33.5 feet east of the Temple Block azimuth station.

Tooele County, Lake Shore, 1887.—The station is south of the Lake Shore bench 163 feet.

Tooele County, Mount Guyot (Deseret), 1892.—The station is immediately east of the geodetic station which is on the summit of the highest peak of the Onaqui Mountains.

Utah County, Provo, 1883.—The station is in the public square, 177 feet 3 inches from the southeast corner of the court-house and 173½ feet from the northwest corner of a dwelling house across the street. Prolongations of the east side of the court-house and of the north side of the aforesaid dwelling house intersect at the station. It is marked by a stone 8 inches by 10 inches by 6 inches, with a cross mark upon it, sunk flush with the surface of the ground.

Weber County, Ogden, 1886.—The station is near the observatory on the west bank of the Weber River, directly opposite the town, and a little more than a mile from the court-house. It is 30 meters due south of the east pier in the west room of the observatory.

Weber County, Ogden, 1888.—The station is on a peak of the Wasatch Range of mountains about 4 miles east from the town of Ogden.

VERMONT.

Chittenden County, Burlington, 1898.—Station is the south stone of the meridian line on the campus of the University of Vermont, in the rear of the buildings. It is marked by a granite post with a copper bolt. North stone is 719.3 feet distant, and projects about 6 inches above ground. The mark or range was the rod on the cupola of the college barn, and bears 35° 33′.7 east of true south.

Rutland County, Rutland, 1898.—Station is in a lot owned at present by F. L. Sherwin. It is marked by a marble post 6 by 6 inches, set in concrete. About 750 feet true north of this stone is set a similar post marking the true meridian. Both stones are marked on top

U. S. C. & G. S.
18 ⊙ 90
Meridian mark.

Messrs. L. W. Fuller, J. Stickney, and G. W. Ross all know the location of these stones. South meridian stone is on the west side of Lincoln boulevard, just inside the fence at its southern end, between Kendell and Roberts avenues. North meridian stone is just south of schoolhouse at the corner of Crescent street and Lincoln boulevard. The mark or range was the rod on the schoolhouse cupola, and bears 0° 57′.7 east of true north.

Washington County, Montpelier, 1898.—Station is in the meridian line on campus of Montpelier Seminary. The south meridian stone is 349.4 feet south of magnetic station, and north stone is 49.2 feet north of station. These stones are granite posts, 8 by 8 inches, and 3½ feet long, tops projecting about 8 inches above grounnd. Stones are marked

U. S. C. & G. S.
18 ⊙ 98
Meridian.

Windham County, Brattleboro, 1898.—The magnetic station and meridian line are inside the race track of the Valley Association fair grounds, which are about 1¼ miles from the depot. Station is near the north side of the race track, and is the north end of the meridian line. It is marked by a granite post 8 by 8 inches by 3½ feet long, buried 3 feet in the ground. Top of stone lettered U. S. C. & G. S.

18 ⊙ 98
Meridian.

Due south 592½ feet a similar granite post is set. This stone is not lettered. Mr. George Hines knows the location of these stones. The mark or range is the finial on Richardson's barn, and bears 13° 20′.0 west of true south.

VIRGINIA.

Accomac County, Accomac, 1897.—The station is located in the large open lot just west of the court-house square. It is near the southern edge of the lot and near the road. The point is marked by a heavy granite post, sunk 4 feet in the ground. It is lettered on the top U. S. C. S., with a small hole and bolt marking the exact point. At the north side of this lot, near the fence, another granite post was sunk marking the true meridian. The tops of these stones are dressed 4 inches square and project about 4 inches above the surface of the ground.

Albemarle County, Charlottesville, 1900.—Observations were made over a point 27 meters from the north stone of the meridian line established in the athletic grounds of the University of Virginia in 1897, in the direct line joining this stone and the first chimney visible to the right of the university museum, and just appearing above the surface of the ground under the trees. The mark or range used was the edge of the gatepost seen almost in the same direction as the chimney described above. This mark or range bears 0° 34′.8 west of true south. The northeast vane on the tower of the museum bears 6° 49′.2 east of true south. The center of the south stone of the meridian line bears 0° 12′.2 east of true south.

Albemarle County, Charlottesville, 1901.—The station is 27 meters south of the north stone of the meridian line on the athletic grounds of the University of Virginia, as near the station of 1900 as could be determined. The mark or range used was the northeast vane on the tower of the university museum and bears 7° 44′.9 east of true south.

Albemarle County, Greenwood, 1900.—Observations were made over a brass nail in a locust post 2½ feet long, 4½ inches in diameter, and set about flush with the ground. It was located on the estate of the late Dr. G. Roy Baylor, about 3 miles south of Greenwood station, Chesapeake and Ohio Railroad. It is 111.5 feet west of the residence and is 66 feet north of the underground ice house. It is about 150 yards east and about 50 yards south of the old magnetic station on these grounds. The mark or range used was the rod on the central gable of a house about 2½ miles distant. This mark or range bears 39° 05′.3 east of true north.

Alexandria County, Cherrydale, 1900.—Observations were made over the magnetic station established in the grounds of the residence of Mr. E. D. Preston at Cherrydale, and over the same point where observations were made in 1896, 1897, 1898, and 1899. It is 142 feet 1½ inches from a tack in the porch of Mr. Preston's house, and east of it. The angle at the tack on the porch, between the magnetic station and Fairfax Seminary spire equals 73° 55′. The angle at the magnetic station between the Washington Monument and the Fairfax Seminary spire equals 72° 14′ 42″.5, and between Fairfax Seminary spire and the tack on the porch equals 105° 48′. The mark or range used was the Fairfax Seminary spire. This mark or range bears 11° 48′.4 east of true south.

Alleghany County, Covington, 1900.—Observations were made over a stub driven in the ground near the center of a block of land bounded by Prospect avenue, Munro, McCurdy, and Highland streets. It is behind the Intermont Hotel, in a field which belongs to Mr. G. D. Kline, estate agent. This stub is approximately in line with the center of the east wing of this hotel, about 73 and 135 feet, respectively, from the south and east fences of the field in which it is situated. It is about 300 yards east of the point in the garden of the old McCurdy Hotel, where observations were made in 1873 and in 1881, which is no longer suitable for magnetic observations. The McCurdy Hotel has been burned. The mark or range used was the spire of the colored Baptist church. This mark or range bears 18° 29′.3 west of true south. The point on the tower of the public school bears 68° 28′.4 west of true north. The point of the tower of the court-house bears 54° 07′.1 west of true north. The point on the tower of the Catholic church bears 38° 48′.9 east of true south.

Amelia County, Amelia, 1901.—A meridian line 360.4 feet long was established on the court-house grounds. It is marked by two limestone posts 6 by 8 inches, projecting about 9 inches above ground and lettered U. S. C. & G. S. N. M. and U. S. C. & G. S. S. M., respectively. Observations were made at the north stone. The mark or range used was the tip of the roof on a small white house which bears 0° 32′ east of true south.

Amherst County, Amherst, 1901.—A meridian line 233 feet long was established in the public school grounds. It is marked by two limestone posts 6 inches square, projecting about 6 inches above ground, and lettered U. S. C. & G. S. N. M. and U. S. C. & G. S. S. M., respectively. Observations were made over the south stone. The southeast corner of the Baptist church bears 1° 51′ west of true north.

VIRGINIA—Continued.

Appomattox County, Appomattox, 1901.—Observations were made in what was formerly the court-house yard over the north stone of a meridian line established about twenty years before by a local surveyor. The post is of granite 1 foot square, projecting about 3 feet above ground. The mark or range used was the south stone about three-quarters of a mile away, which bears 3° 04′.6 east of true south, showing that the line is in error by that amount.

Appomattox County, West Appomattox, 1901.—A meridian line was established on the court-house grounds, and marked by two limestone posts, 6 by 8 inches, projecting about 8 inches above ground, and lettered U. S. C. & G. S. N. M. and U. S. C. & G. S. S. M., respectively. Observations were made at a point about 12 feet due north of the north stone and also over the south stone. From the south stone the Presbyterian church spire bears 79° 20′ east of true south.

Augusta County, Staunton, 1900.—Observations were made over the heavy limestone pillar planted here by the U. S. C. & G. S. This pillar is set firmly in the ground, with its top projecting 1 foot above the grass. It is 1 foot square, with a small hole marking the center. This stone pillar is upon the highest point of the hill, south of the Chesapeake and Ohio Railway and the water tank. This hill is about 100 feet above the railway. The pillar is about 400 feet from the railway track, between a large tree, the only one in the field, and the fence bounding the oak grove, west of it. There is a ledge of limestone rock projecting above the grass, 300 feet north of this stone pillar. The mark or range used was the spire of the Presbyterian church. This mark or range bears 4° 45′.2 east of true north.

Augusta County, Burketown, 1900.—Observations were made over a point three-fourths of a mile south of Burketown, on the Valley pike, in the field of Mr. Butler Burke, on one side of which is the Valley pike and on the other the county road. It is about 13 miles north of Staunton, Va., and it is 97.15 feet distant from the 13-mile post and 79.15 and 47 feet, respectively, from the centers of the county road and the Valley pike. It is also distant 83.65 and 36.15 feet, respectively, from a small locust tree on the west side of the pike and from a black walnut tree. The mark or range used was the rod on a barn, across the county road. This mark or range bears 49° 10.′1 west of true south.

Bath County, Warm Springs, 1900.—Observations were made over a limestone rock, already planted as the south stone of a meridian line, established some twenty years ago by a local surveyor, Mr. Michael Mustoe. This stone is in the court-house lot, 54 feet from the southwest corner of the court-house building. It is distant 42.1, 25.35, and 51.2 feet, respectively, from three small maple trees standing near the plank fence west of the court-house. The north stone of this meridian line is about 800 yards north of the south stone, in the grounds of the Warm Springs Hotel Company. It is cut off by trees. The mark or range used was the edge of a house near the stable of the Warm Springs Hotel. This mark or range bears 3° 24′.8 east of true north. The point of the monument to Col. W. D. Erwin bears 17° 36′.9 west of true south. The point of the monument to Thomas B. McCallister bears 22° 35′.9 west of true south. The point of the monument to G. H. Fry bears 25° 20′.7 west of true south. The Presbyterian church spire bears 84° 48′.9 west of true south.

Bedford County, Bedford City, 1901.—A meridian line was established on the grounds of Randolph Macon Academy. It is marked by two limestone posts, 6 by 8 inches, projecting about 6 inches above ground and lettered U. S. C. & G. S. N. M. and U. S. C. & G. S. S. M., respectively. The south stone is at the foot of the walk leading to the main entrance of the school building and the north stone is about 600 feet distant, near the baseball grounds. Observations were made over the south stone. The mark or range used was the north spire of the Episcopal church steeple, and bears 71° 23′.5 east of true south.

Botetourt County, Fincastle, 1902.—The station is in the schoolhouse grounds 37.6, 31.0 and 155 feet, respectively, from the west fence, the north fence, and the southwest corner of the schoolhouse. The station is marked by a stone 6 by 7 inches projecting 3 inches above ground. The Episcopal church spire bears 30° 42′ west of true north, the Presbyterian church spire 16° 04′ east of true north, and the Methodist church spire 66° 31′ east of true north.

Buckingham County, Buckingham, 1901.—A meridian line 198 feet long was established in a pasture belonging to Mr. Garnett, who lives about one-third of a mile southeast of the court-house. It is west of his dwelling and about 300 feet west of the pasture fence. It is marked by two limestone posts, 6 by 8 inches, projecting about 6 inches above ground and lettered U. S. C. & G. S. N. M. and

VIRGINIA—Continued.

U. S. C. & G. S. S. M., respectively. Observations were made over the south stone. The mark or range used was the east edge of chimney on Mr. Grigg's house, and bears 39° 10′.5 west of true south.

Campbell County, Lynchburg, 1901.—The station is located on the bluff just across James River and opposite the city of Lynchburg. It is in line with the eastern edge of Twelfth street when extended across the river. The point is marked by the center of a small hole in a sandstone rock, which rock is sunk 2 feet in the ground, and stands 3 inches above the ground. This stone is 21.5 feet from the corner of Jacob Myers's garden and 36.7 feet from the corner of John Acres' garden. The spire of the large brick Baptist church bears 61° 47′ west of true south. The Catholic church spire bears 86° 25′ west of true south.

Campbell County, Rustburg, 1901.—A meridian line 230 feet long was established in the public school grounds. It is marked by two limestone posts, 6 by 8 inches, projecting about 6 inches above ground and lettered U. S. C. & G. S. N. M. and U. S. C. & G. S. S. M., respectively. Observations were made at a point 14 feet from the south stone in the direction of the south end of the roof of a small house, which bears 82° 20′ east of true south.

Carroll County, Hillsville, 1902.—The station is in front of the court-house near the middle of the main street 84.5, 49.0, 95.5, and 109.8 feet, respectively, from the southeast and northeast corners of the Tipton Building and the northwest and southwest corners of the court-house. The station is marked by an irregular stone 1 foot in diameter, set with its top about 2 inches below the surface. Another stone was placed due south, just in front of the steps to Johnson & Early's store, projecting about 3 inches above ground. The mark or range used was the Presbyterian church spire and bears 18° 58′.7 east of true south.

Charles City County, Charles City, 1901.—A meridian line 168 feet long was established in the court-house yard. It is marked by two Bedford limestone posts 6 by 8 inches, projecting 7 inches above ground, and lettered U. S. C. & G. S. N. M. and U. S. C. & G. S. S. M., respectively. Observations were made over the south stone, which is 108 feet from the nearest corner of the court-house and 84.7 feet from the side of the jail. The mark or range used was the south side of the window in blacksmith's shop, and bears 75° 21′.7 west of true south.

Charlotte County, Smithville, 1901.—A meridian line 197.8 feet long was established in the public school grounds. It is marked by two limestone posts 6 by 8 inches, projecting about 9 inches above ground, and lettered U. S. C. & G. S. N. M. and U. S. C. & G. S. S. M., respectively. Observations were made at the north stone. The mark or range used was the south edge of the north chimney at the northeast end of a brick house, and bears 85° 11′.6 west of true north.

Clarke County, Winchester, 1900.—Observations were made over a point in the Mount Hebron cemetery in the pathway, directly in front of and west of the Rouss monument. The point is distant 5 feet from the east edge and 7 feet from the west edge of this path and 126.48 feet from the base of this C. B. Rouss monument. It is also distant 104.9 and 127.8 feet, respectively, from the edge of the sill of the gate and from the acorn of the tablet of this monument. The mark or range used was the rod to the spire to the court-house above the gilt ball. This mark or range bears 52° 34′.3 east of true south. The center of the cross on the Catholic church bears 71° 47′.5 east of true north. The center of the cross on the Presbyterian church bears 81° 38′.6 east of true north. The spire above wing on the German Reform church bears 81° 44′.6 east of true south. The cross on the Lutheran church bears 63° 22′.5 east of true south.

Craig County, New Castle, 1902.—The station is in the south corner of the court-house yard, 11.7, 13.9, and 95.0 feet, respectively, from the southeast fence, the southwest fence and the east corner of the court-house. The station is marked by a granite post, 6 by 9 inches, projecting about 6 inches above ground. The mark or range used was the flag pole on the Bel Air Hotel, and bears 18° 33′.6 west of true south. The flag pole on the Craig City Inn bears 5° 55′.4 east of true north.

Culpeper County, Culpeper, 1900.—Observations were made over a point 17 meters east of the south stone of the meridian line established in the Southern Railway stockyards in 1897 in a line joining the center of this stone and the cupola of the court-house. These stockyards are about one-half a mile east of the town of Culpeper and north of the Southern Railway track. This south meridian stone stands near the corner of the lot and near the summit of the ridge. It is a granite post 3 feet long,

VIRGINIA—Continued.

set 34 inches in the ground, 6 by 6 inches on top, and lettered U. S. C. S., with a small hole marking the center. There is a north meridian stone set 170 meters true north of this stone, but not lettered. The mark or range used was the central rod on the cupola of the court-house. This mark or range bears 72° 55′.2 west of true south.

Cumberland County, Cumberland, 1901.—A new meridian line was established and marked by two limestone posts 6 by 8 inches, projecting about 6 inches above ground. The south stone is in the court-house yard near the south fence and is lettered U. S. C. & G. S. S. M. The north stone is about 700 feet distant and is lettered U. S. C. & G. S. N. M. Observations were made over the north stone, from which the northwest corner of the court-house bears 6° 49′.7 west of true south.

A meridian line previously established by a local surveyor was tested by setting up over the north and pointing upon the approximate centers of the other two stones. The bearing of the south stone was found to be 0° 02′ west of true south and of the middle stone 0° 04′ west of true south.

Dinwiddie County, Dinwiddie, 1901.—A meridian line was established and marked by two granite posts 7 inches square at the top and projecting about 7 inches above ground. The north stone is near the northwest corner of the court-house yard. The south stone is 357.2 feet distant on the south line of the court-house property. Observations were made at the north stone. The mark or range used was the lightning rod near the south end of Mr. Stern's house, and bears 64° 42′.7 east of true north.

Dinwiddie County, Petersburg, 1901.—A meridian line about 1 000 feet long was established at the city waterworks, to the southeast of the city. It is marked by two granite posts 8½ inches square at the top and projecting about 4 inches above ground. They are on the north and south banks of the lake northwest of the pump house. Observations were made at the south stone. The mark or range used was the middle of a chimney on the tobacco stemmery, and bears 2° 18′.2 west of true north.

Elizabeth City County, Old Point Comfort, 1902.—The station is on the point west of the light-house.

Fairfax County, Fairfax, 1900.—Observations were made over a granite post 3 feet long, 6 by 6 inches on top, and lettered U. S. C. S., with a small hole marking the center. This granite post was located in the southwest corner of the court-house grounds at Fairfax. A similar granite post was placed due north of this post in the court-house square, between the county jail and the court-house. This post is not lettered, but it has a small hole in its top marking the center. The meridian line established by the county surveyor is in error 0° 44′.1 west of true north or 0° 44′.1 east of true south. The mark or range used was the tall slender monument in the graveyard northwest of the station. This mark or range bears 64° 39′.9 west of true north. Observations were also made over this point in 1897.

Fauquier County, Alwington, 1900.—Observations were made at a series of points in this vicinity in order to test the availability of this region for a magnetic observatory. The main station was at Alwington, in the front garden of Mr. Scott Nesbit. A traverse line was run out with a compass declinometer. Observations were also made at Calverton, 8 miles east of Alwington. The observations indicated that Alwington is a greatly disturbed magnetic region.

Fauquier County, Calverton, 1900.—About 8 miles east of Alwington.

Fauquier County, Rectortown, 1900.—Observations were made over a point in the old town about one-half a mile from the railway, back of a brick building and store now occupied by Mr. Lewis, on land which is the property of Mr. Price. It is on level ground and in line with the west wall of this store building, 209.4 feet north of the northwest corner of the store. It is also east of a ledge of rocks and in line with an inch iron bolt set in one of these rocks and the tower of the school building, which is west of the station. The mark or range used was the spire of a church. This mark or range bears 41° 04′.6 east of true south.

Floyd County, Buffalo, 1895.—At the geodetic station on the summit of Buffalo Mountain.

Fluvanna County, Palmyra, 1901.—A meridian line was established and marked by two limestone posts 6 by 8 inches, projecting about 6 inches above ground. The south stone is in the northwest corner of the court-house grounds and is lettered U. S. C. & G. S. S. M. The north stone is on the edge of a field belonging to Judge Sheppard, 653 feet from the south stone, and is lettered U. S. C. & G. S. N. M. Observations were made over both stones and at a point 65 feet southwest of the north

VIRGINIA—Continued.

stone and 15 feet west of the meridian line. The latter place proved to be locally disturbed. From the north stone the northwest corner of the Methodist church bears 6° 21′ east of true south.

Franklin County, Rockymount, 1901.—A meridian line was established and marked by two limestone posts 6 by 8 inches, projecting about 6 inches above ground. The south stone is near the northwest corner of the public school grounds, about 20 feet from the north fence and 12 feet from the road on the west, and is lettered U. S. C. & G. S. S. M. The north stone is about 600 feet distant on Mr. Thomas Webb's lawn near the north fence and is lettered U. S. C. & G. S. N. M. Observations were made over the south stone. The southwest corner of Mr. Webb's house bears 1° 31′ east of true north.

Giles County, Pearisburg, 1902.—The station is in the public school grounds, 43 feet 10 inches, 31 feet, and 76 feet 11 inches, respectively, from the northwest, southwest, and south corners of the school building. It is marked by a cedar post 8 inches in diameter, set flush with the surface of the ground. The Presbyterian church spire bears 35° 13′.4 west of true north. The court-house spire bears 33° 51′.9 west of true north.

Gloucester County, York River, 1902.—The station is on a small island at the mouth of the York River, opposite Tue Marshes Light-House.

Goochland County, Goochland, 1901.—A meridian line 178 feet long was established on the court-house grounds. It is marked by two limestone posts 6 by 8 inches, projecting about 6 inches above ground, and lettered U. S. C. & G. S. N. M. and U. S. C. & G. S. S. M., respectively. Observations were made over the north stone. The mark or range used was a windmill 3 miles distant and bears 56° 25′.6 west of true south.

Grayson County, Oldtown, 1902.—The station is on the lot of W. R. Warrick near the Methodist Episcopal church, 9.5 feet south of the building line and 31.5 and 53.0 feet, respectively, from the southeast and southwest corners of the lot. It is marked by a soapstone monument about 1 foot in diameter, projecting 2 inches above the ground. The mark or range used was the spire on J. B. Waugh's house, about one-fourth mile distant, and bears 14° 49′.1 west of true south. The gable of house of J. C. Reavis bears 31° 41′.4 west of true south.

Grayson County, Rogers, 1894.—The station is 3 miles by trail from Elk Garden, which is 18 miles by road southeast of Chilhowie. It is marked by a drill hole, intersecting grooves, and the letters U. S. C. S. cut on a large rock on the summit of the mountain.

Greene County, Stanardsville, 1900.—Observations were made over a sandstone rock 30 inches long, set 25 inches in the ground, 7 by 10 inches on top, with a small hole marking the center. This stone was placed upon lands of Mrs. A. B. Monday, one-fourth of a mile west of the town, upon a slight rise north of the pike. It is 79.9 feet north of a small cedar tree in a fence row, in line with two prominent bowlders in this pasture field, between it, the cedar tree and the pike. It is distant 20.5, 43.4, and 90 feet, respectively, from the first bowlder, the second bowlder, and the center of the pike or public road. The mark or range used was the center rod on the court-house spire. This mark or range bears 77° 38′.0 east of true south. The Methodist church spire bears 82° 24′.7 east of true south. The Episcopal church spire bears 85° 42′.9 east of true north.

Greenville County, Emporia, 1897.—The station is located in a large open lot in the northwestern section of the town. This lot belongs to the county. The station is near the southern edge of the lot, in front of the high school building. It is marked by a heavy granite post sunk 4 feet in the ground. This post is dressed 4 inches square at its top and is lettered U. S. C. S. with a small hole and bolt marking the exact point. It extends about 4 inches above the earth's surface. North of the post, in the northern section of the lot, another heavy granite post was sunk marking the true meridian.

Halifax County, Houston, 1897.—The station is located in a vacant lot just southwest of the court-house. It is on the west side of the lot which is owned by Mrs. Boldru. A granite post was set 25 meters north of the magnetic station. This stone is 4 feet long and 6 inches square, is set 3½ feet in the ground, and is lettered on top U. S. C. S. It is 15 meters from the fence along the north and south road, about 100 meters from the southwest corner of the court-house grounds, and 38 meters from the fence in prolongation of the south line of the court-house grounds.

Henrico County, Richmond, 1901.—The station of 1897 in the New Reservoir Park in the open

VIRGINIA—Continued.

space just south of the lake was reoccupied as near as could be determined. Since that time considerable grading has been done, and in consequence the stones marking the meridian line have been covered, the south stone now being buried 4 or 5 feet and the north stone a few inches.

Henry County, Martinsville, 1901.—Magnetic observations were made at four places in Martinsville, indicating considerable local disturbance. The first station was in an open space west of the public school, about 75 feet from the school building. A second station was 300 feet due south of the first, at the edge of the public sidewalk. These proving unsuitable for the ends of a meridian line, a place was selected about a quarter of a mile farther west, beyond the Norfolk and Western Railroad track, on the property of Benjamin Lavinder. The north stone was placed on top of the hill nearest to the public school, bearing south 21° west from the schoolhouse. The south stone is 700 feet distant in an orchard. These stones are of limestone, 6 by 8 inches, projecting about 9 inches above ground and lettered U. S. C. & G. S. N. M. and U. S. C. & G. S. S. M., respectively. Observations were made over both stones.

Highland County, Monterey, 1900.—Observations were made over a sandstone post 2½ feet long, set 27 inches in the ground, 4 by 6 inches on top, with a small hole marking the center. This stone was placed on a hill called Academy Hill, northwest of the town and east of the graveyard, on land which is the property of V. B. Bishop. It is in a direct line between the cupola of the court-house, distant 300 yards southwest of this rock, and a small apple tree, and nearly in the line of Spruce street if it were prolonged to the northwest. It is distant 115.8 and 168.5 feet, respectively, from the northeast corner of the recent addition to the graveyard, and from the marble stone marking the grave of Josephine M. Golaw. The mark or range used was the central rod on the cupola of the court-house. This mark or range bears 21° 58′ west of true south. The spire of the Methodist church bears 18° 52′ east of true south. The center of the cupola on the Presbyterian church bears 27° 57′.6 west of true south.

James City County, Williamsburg, 1887.—The station is about 380 feet northwest of the spire of the William and Mary College and is marked by a stone post. The mark or range used was the base of the iron rod on the college building and bears 28° 50′ east of true south.

Lancaster County, Rappahannock River, 1902.—The station is a short distance back from Windmill Point, on the north side of the mouth of the Rappahannock River.

Lee County, White Rock, 1893.—At geodetic station. The station is on the line between Virginia and Kentucky and about 3 miles by direct road and trail from Ewing, a station on the Louisville and Nashville Railroad. It is marked by a drill hole, intersecting grooves, and the letters U. S. C. S. cut on a large rock whose surface is nearly level with the ground.

Loudoun County, Leesburg, 1900.—Observations were made over the center of the north meridian stone of the meridian line established by the U. S. C. & G. S. in 1897 in the playground on the west side of the Leesburg Academy. The mark or range used was the south meridian stone of this meridian line.

Loudoun County, Round Hill, 1900.—Observations were made over the same point occupied in 1897 in the pasture field of Mr. Lodge, who owns the store nearest the railway station. The field is on the north side of the railway, and the point is in the north side of the field about 33 feet south of the stone fence. It is 24 and 61.7 feet from the nearest side of a cherry tree and a locust tree, one northeast and the other northwest of this point. The latitude, longitude, and true meridian were determined at a point south and a little west of this spot with a zenith telescope in 1897. The mark or range used was the cupola of a barn across the railway. This mark or range bears 1° 31′.4 west of true south.

Louisa County, Louisa, 1901.—A meridian line 376 feet long was established in Senator Bibb's orchard, about one-fourth mile northwest of the court-house. It is marked by two limestone posts, 6 by 8 inches, projecting about 6 inches above ground and lettered U. S. C. & G. S. N. M. and U. S. C. & G. S. S. M., respectively. Observations were made at the south stone, which is about 30 feet from the south fence of the orchard and 150 feet from the east fence. The mark or range used was the south edge of the chimney on Haley's schoolhouse and bears 34° 30′.6 east of true south.

Madison County, Madison, 1900.—Observations were made over a red sandstone rock, set level with the ground, 6 by 6 inches on top, with a small hole marking the center. This stone was placed in

VIRGINIA—Continued.

the grounds of Congressman James Hay, in an apple orchard, and northeast of his house. It is distant 28.5 feet from a picket fence and is 35.45 feet southwest of a large cherry tree. The cupola of the court-house is seen directly over the center of the new brick county jail, and it was used as the mark or range. This mark or range bears 88° 08′.6 west of true north.

Montgomery County, Christiansburg, 1897.—Two granite posts about 6 inches square were set to mark a true north and south line. The north stone is nearly on the south line of Mill street and about 3 meters west of the west side of a lane extending up the ridge from a point about 100 meters east of the railroad station. It is on the west side of the summit of the ridge nearly 200 meters east of the colored school. The south stone is on Main street about 1 meter from the east fence, about 200 meters from the north stone, and about 50 feet north of the deepest gully. The magnetic station was about 20 meters from the north stone, exactly in line to the Presbyterian church spire. This spire was used as mark or range and bears 30° 14′.3 west of true south.

Nansemond County, Hines, 1887.—The station is about 150 feet north of the boundary station. The boundary station is on the road to Jonesville, near Dr. Hines's office. It is marked by a granite post set in the stump of an oak tree at the crossroads. Dr. Hines's house is about one-half mile west of Dismal Swamp.

Nelson County, Lovingston, 1901.—A meridian line was established and marked by two limestone posts, 7 by 10 inches, projecting about 6 inches above ground and lettered U. S. C. & G. S. S. M. and U. S. C. & G. S. N. M., respectively. Observations were made over the south stone, which is in a field belonging to Mr. Edward Kidd, county clerk. The north stone is about 600 feet distant, in the court-house yard. The mark or range used was the southeast corner of the colored church and bears 62° 43′.0 west of true north.

New Kent County, New Kent, 1901.—A meridian line 202 feet long was established in the court-house yard. It was marked by two Bedford limestone posts, 6 by 8 inches, projecting about 6 inches above ground and lettered U. S. C. & G. S. N. M. and U. S. C. & G. S. S. M., respectively. Observations were made over the south stone. The mark or range used was the southeast corner of the chimney on Mr. Vaiden's house and bears 78° 29′.6 west of true north.

Norfolk County, Dismal Swamp Canal, 1886.—The station is about 100 feet north of the boundary stone. This stone is on the Dismal Swamp Canal, about 4 miles south of Wallaceton. It is on the east edge of the road that runs along the eastern side of the canal and not more than 20 feet from the canal.

Norfolk County, Norfolk, 1897.—The station is located in the northeastern suburbs of the city, in The New City Park. It is in the open space just south of the road leading to the new pavilion. It is marked by a heavy granite post sunk 4 feet in the ground. The top of this post is dressed 4 inches square and is lettered U. S. C. S. with a small hole and bolt marking the exact point. It extends about 4 inches above the surface of the ground. The true meridian is marked by this stone and another heavy granite post north of this one, near the woods.

Nottoway County, Nottoway, 1901.—A meridian line 199.4 feet long was established on the court-house grounds. It is marked by two limestone posts, 6 by 8 inches, projecting about 6 inches above ground and lettered U. S. C. & G. S. S. M. and U. S. C. & G. S. N. M., respectively. Observations were made at the south stone, from which the northwest corner of Deans's store bears 83° 55′ east of true south. A merdian line established some years ago by a local surveyor was tested by means of azimuth observations made over the approximate center of the middle stone. These observations show that the line bears 0° 12′ west of true north.

Northampton County, Cape Charles City, 1900.—The station is located on a small sand hill on the bay shore. It is at the foot of the main street extended, and in line with the northern row of cottonwood trees which are on the edge of this street. It is 17 feet from a pine tree and 75 feet from the shore end of the stone breakwater. It is marked with a solid oak post sunk 2½ feet in the ground. The mark or range used was the central rod of the range light-house on the end of the breakwater and bears 77° 13′.7 west of true south.

Orange County, Orange, 1900.—Observations were made over a soft sandstone rock, with a small cross marking the center. This undressed sandstone rock is upon the land of William C. Williams, superintendent of the public school, one-fourth of a mile southeast of the Southern Railway station. It is in the center of a small horse lot north of Mr. Williams's barn and southeast of his brick house.

VIRGINIA—Continued.

It is distant 233.5, 54.2, and 80.7 feet, respectively, from Mr. Williams's porch and from the south and west fences of this horse lot. The mark or range used was the west edge of the east window in the barn on the hill one-fourth of a mile northeast of the station. This mark or range bears 14° 32′.4 east of true north. The center of a shaft on a prominent tombstone bears 44° 34′.7 east of true south. The rod on the cupola of the court-house, seen through the trees, bears 28° 23′.9 west of true north. The northeast edge of the brick pillar (at the brick band 5 feet up) of the porch to Mr. Williams's house bears 73° 26′.0 west of true north.

Page County, Luray, 1900.—Observations were made over a limestone rock, 3 feet long, set 30 inches in the ground, 5 by 9 inches on top, with a small hole marking the center. This stone was placed in the grounds of the Luray Caverns Company, east of the Norfolk and Western Railway, and south of the avenue of trees leading to the ruins of the hotel. It is on the slope of a hill, not quite at its highest level, is west of the ruins of the Luray Inn and a clump of bushes. It is 44.6 feet south of the south driveway and 137.1 feet southwest of the southwest corner of the southwest limestone column of the old hotel. The mark or range used was the cupola of the school building. This mark or range bears 62° 37′.9 west of true north. The acorn on the cupola of the county jail bears 65° 58′.8 west of true north. The northeast edge of the tower of the court-house bears 68° 56′.4 west of true north. The spire of the Lutheran church bears 48° 52′.6 east of true north.

Patrick County, Stuart, 1901.—A meridian line was established on property of W. W. Moir. This property is about 500 yards northwest of the court-house and 250 yards north of the tanyard, just south of Mr. Rucker's orchard and southwest of the highest point on Indian Grave Ridge. It is marked by two limestone posts, 6 by 8 inches, projecting about 7 inches above ground and lettered U. S. C. & G. S. N. M. and U. S. C. & G. S. S. M., respectively. The south stone is at the edge of the woods, about 16 feet to the right of a path leading northward through the clearing. The north stone is about 580 feet distant. Observations were made at a point 132 feet southwest of the south stone, and also over the south stone.

Pittsylvania County, Chatham, 1901.—A meridian line about 350 feet long was established on the grounds of the Episcopal College. It is marked by two limestone posts, 6 by 8 inches, projecting about 8 inches above ground and lettered U. S. C. & G. S. N. M. and U. S. C. & G. S. S. M., respectively. The south stone is near the southwest corner of the campus. Observations were made at a point 66.9 feet from the south stone, in the direct line to the Baptist church spire, which was used as a mark. Declination observations were also made over the two meridian stones. From the south stone the Baptist church spire bears 83° 17′ west of true north. The Episcopal church spire bears 63° 52′ west of true north.

Powhatan County, Powhatan, 1901.—A meridian line 249 feet long was established in the court-house grounds. It is marked by two limestone posts, 6 by 8 inches, projecting about 7 inches above ground and lettered U. S. C. & G. S. N. M. and U. S. C. & G. S. S. M., respectively. Observations were made at the north stone. The mark or range used was the east edge of the chimney, at the south end of the brick house occupied by Henry Johnson, colored, and bears 14° 11′.2 west of true south.

Prince Edward County, Farmville, 1901.—A meridian line was established on the lot inclosed by the race track, southwest of the town. It is marked by two limestone posts, 6 by 8 inches, projecting about 8 inches above ground. The south stone is on the hilltop at the south end of the track, and is lettered U. S. C. & G. S. S. M. The north stone is about 400 feet distant, and is lettered U. S. C. & G. S. N. M. Observations were made at the south stone. The mark or range used was the Methodist church spire, and bears 26° 08′.7 east of true north.

Princess Anne County, Cape Henry, 1895.—On the beach between the old light-house and the ocean, about 300 yards from the light-house.

Prince William County, Manassas, 1900.—Observations were made over a point located in the private grounds of "Annaburg," the residence of Robert Portner, esq., in the open space on the north side of the main drive, near a slight elevation where the brown slate comes near the surface; it is also near the first bend in the farm road which leaves the main drive immediately to the east of the gardener's lodge at the gate. It is distant 36.7, 45, and 67.6 feet, respectively, from the center of the road, from the center of the first cedar tree on the right hand side of the farm road approaching from

VIRGINIA—Continued.

the lodge, and from an adjacent white pine tree. The mark or range used was the center of the rod on the Baptist church. This mark or range bears 18° 50′.5 east of true north. The cross on the Episcopal church bears 55° 31′.9 east of true north. The spire of the Southern Methodist church bears 9° 54′.9 east of true north. The cross on the Catholic church bears 3° 05′.5 west of true north.

Pulaski County, Pulaski City, 1902.—The station is in the court-house yard 37.6 feet from the east fence and 55.0 feet from the north fence. It is marked by a cubical block of stone, each dimension 1 foot, set flush with the ground. The Baptist church spire bears 74° 19′.0 west of true north. The Lutheran church spire bears 17° 30′.0 east of true north.

Rappahannock County, Washington, 1900.—Observations were made over a sandstone post 30 inches long set 27 inches in the ground, 5 by 5 inches on top, with a small hole marking the center. It was placed on the land of Mrs. B. E. Hackly, about one-fourth of a mile southwest of the town. This stone is upon the top of a slope west of the road, and 98.5 feet from the nearest corner of Mrs. Hackly's brick house. A meridian stone has already been set in the gutter of the county road in front of Mrs. Hackly's house as the south meridian stone of a meridian line, but this meridian line could not be tested and used. The mark or range used was the spire of the Baptist church. This mark or range bears 68° 18′.5 east of true north. The west corner of the cupola of the court-house bears 58° 18′ east of true north. The Methodist church spire bears 49° 55′.1 east of true north.

Roanoke County, Salem, 1900.—The station is situated in a large vacant lot about three-fourths mile north of Main street, at the foot of the ridge on which the Baptist orphanage stands. The lot is across the road from a single dwelling house belonging to Judge Moffat, and occupied by his sister. The station is almost in a line with the south end of this house. It is 70.5 feet from the center of the most westerly of the three locust trees on the lot, and 72 feet from the center of the roadway bounding the lot on the west side.

Rockbridge County, Goshen, 1900.—Observations were made in the grounds of the Alleghany Hotel, on the hill, about 75 feet above the Chesapeake and Ohio Railroad, and south of the station. It is upon the point of a hill on level ground, between some white oaks, and north of the road leading to the hotel. It is distant 82.3 and 72 feet, respectively, from this road and from the edge of a bank. It is distant 57.8, 49.6, 51, and 30.95 feet, respectively, from four white oaks. The mark or range used was the spire of the Methodist church. This mark or range bears 4° 56′ west of true north. The cupola of the hotel bears 70° 47′.0 west of true north. The Presbyterian church spire bears 6° 09′.5 west of true north.

Rockbridge County, Lexington, 1897.—The station is located on the grounds of Washington and Lee University, and is on the first hill south of the railroad and east of the railroad station. A granite post 4 feet by 6 inches by 6 inches on top was set at the north end of the summit of this hill about 200 feet from the railroad. It was set 3 feet in the ground, and has the letters U. S. C. S. cut in its top. It marks the south end of a meridian line. The magnetic station was located east of this stone on the line to the azimuth mark, distant about 18 meters. A similar stone, excepting that it is not lettered, marks the north end of the meridian line. This stone extends about 10 inches above the surface of the ground, and is about 10 meters south of the north fence of the property belonging to the Washington and Lee University. The mark or range used was the end of the brick wall on the north end of the Virginia Military Institute Building, and bears 68° 16′.9 east of true north.

Rockbridge County, Natural Bridge, 1900.—Observations were made over a stub driven in the grounds of the present hotel at the Natural Bridge, the old hotel having been destroyed by fire. It is distant 69.3, 61.5, 103.3, and 77.0 feet, respectively, from four cedars which stand between it and the hotel. It is distant 50.85 feet from the corner of a frame summerhouse. The mark or range used was the small white cross at the left-hand corner of the trellis border of the north end of the porch of the studio of the Jefferson cottage. This mark or range bears 31° 41′.9 west of true south. The right-hand edge of the chimney of the dining room to hotel bears 17° 00′.7 east of true south. The west edge of the west chimney of "Witchwood" bears 63° 10′.9 east of true north. The top of a sugar-loaf mountain over the southwest corner of the slate roof dining room bears 4° 01′.1 east of true south. The southwest edge of the church bears 57° 14′.4 east of true south.

Rockbridge County, North Mountain, 1884.—The station is located near the summit of the mountain, a few hundred yards from the corner of Rockbridge, Alleghany, and Botetourt counties.

VIRGINIA—Continued.

Rockingham County, Elkton, 1900.—Observations were made over a point about 150 yards east of the Norfolk and Western Railway station, on the north side of the county road and upon the south point of a hill upon which stand two churches. It is about 3 feet from the property line of the lots laid off in the "boom town" of 1900. It is distant 166.3 feet from a clump of four silver maples standing on the north side of the county road. The mark or range used was the spire of the Presbyterian church. This mark or range bears 35° 04′.8 east of true north. The spire of the Methodist church bears 32° 46′.6 west of true north. The flagstaff on the north cupola of a summer-resort hotel bears 53° 47′.9 west of true south.

Rockingham County, Harrisonburg, 1900.—Observations were made over a point on the United States property in the lawn east of the new brick building in which are the post-office and the United States circuit court rooms. It is distant 82.57, 108.6, and 80.5 feet, respectively, from the granite posts at the northeast and the southeast corners of this lawn and from the northwest corner of the United States building. The mark or range used was the rod on the cupola of Mrs. Rohr's house. This mark or range bears 9° 00′.2 east of true south. The Baptist church spire bears 15° 58′.7 east of true south. The colored church spire bears 61° 59′.3 east of true north. The colored United Brethren church spire bears 35° 11′.0 west of true south. The spire of the Jewish synagogue bears 13° 52′.4 east of true south. The spire of the Lutheran church bears 41° 46′.0 east of true south. The flag pole on the United States building bears 88° 06′.4 east of true south.

Scott County, Big Knob, 1893.—At the geodetic station on Big Knob.

Shenandoah County, Strasburg, 1900.—Observations were made over a limestone post 3 by 5 inches on top, set 1 foot in the ground and extending 2 inches above the surface of the ground. This limestone post was located in the southeast corner of the old fort erected by General Banks, which is on the top of the hill north of the town. It was placed on a slight rise about 15 feet from the embankment of this fort. The stations formerly occupied at Strasburg can not now be used, as streets have been opened since they were established. The mark or range used was the rod just below the brass ball of the Presbyterian church spire. This mark or range bears 17° 43′.5 west of true south.

Shenandoah County, Woodstock, 1897.—The station is located near the north end of the lot within the race track at the fair grounds about a mile west of town. A granite post 4 feet by 6 inches by 6 inches was set with its top about 8 inches above the ground to mark the north end of a meridian line. It is about 72 meters northwest of the judge's stand and 13 meters southeast of the inner fence of the race track. It is lettered on top U. S. C. S., with a half-inch drill hole. A similar stone, excepting that it is not lettered, marks the south end of the meridian. This stone is set about 5 meters from the inner fence of the race track and about 8 meters east of the quarter-mile post, which is directly opposite the judge's stand. The distance between the stones is about 160 meters. The magnetic station was 13 meters from the north stone in line with the left edge of the chimney of a house about one-half mile distant used as a mark or range. This mark or range bears 51° 43′ west of true south.

Smyth County, Marion, 1898.—The station is located in the grounds of the Marion Female College on the southwest corner of the middle terrace, and is marked by a marble post, the top of which is about 2 inches above the surface of the ground. It is lettered on top U. S. C. G. S. 1898. Across the street in a field and near the south fence a similar stone is set marking the meridian. The mark or range used was the tower of the insane asylum, which bears 79° 21′.3 east of true north.

Spottsylvania County, Fredericksburg, 1900.—Observations were made over a granite stone, 3 feet long, set 3 feet in the ground, 6 by 6 inches on top, and marked $\frac{2636}{3}$. The center of the cross marks the center. This granite stone was placed on the terraced lawn of the Chatham House, on the hill opposite the town, and across the Rappahannock River near the iron bridge. This house was built by the Fitzhughs in 1729, and is well-known in this vicinity. The granite stone is distant 193.7 feet from the foundation of the southeast wing of this house, 10.8 feet from the southeast edge of the upper terrace southeast of the house, and 127.5 feet from the southwest edge of the terrace. This point is distant about 1,000 feet from the magnetic station of 1856 on Browns Island, in the Rappahannock River, which is no longer suitable for magnetic observations. The mark or range used was the iron shaft on the court-house tower just below the gold ball. This mark or range bears 30° 24′.6 west of

VIRGINIA—Continued.

true south. The Baptist church spire bears 51° 01′.2 west of true south. The spire of the Episcopal church bears 35° 38′.2 west of true south.

Stafford County, Stafford, 1900.—Observations were made over a gran. post, the south end of meridian line, set in the ground on the opposite side of the road from the court-house building. There is a copper disk lettered U. S. C. &. G. S. set in the top of this granite post. The center of this disk marks the point. A similar granite post was set 265.7 feet true north of this post, marking a true meridian line. It is located in the northeast corner of the court-house square. The mark or range used was the east edge of door frame of the house on the hill just west of north. This mark or range bears 4° 47′.6 west of true north.

Tazewell County, Tazewell, 1898.—The station is located 41.8 feet almost south of the southeast corner of the Tazewell College building. It is marked by a cylinder of blue limestone about 1 foot in diameter, in which is set a copper disk lettered U. S. C. & G. S. True south, in the yard surrounding Mr. J. G. Buston's house, a similar stone is set, thus marking the meridian. The mark or range used was the spire of the Presbyterian church, and bears 3° 04′.2 east of true south.

Warren County, Front Royal, 1900.—Observations were made over a sandstone rock, 3 feet long, set 31 inches in the ground, 4½ by 6 inches on top, with a small hole marking the center. The letters U. S. are cut on the north face of this stone. It was located in the grounds of the Randolph-Macon Academy, which is on a hill northwest of the town a little over a fourth of a mile from the court-house. This stone is set upon level ground 93.5 feet south of the academy building and south of the driveway. The mark or range used was the spire of the Catholic church. This mark or range bears 29° 48′.6 east of true south. The cupola of the engine house bears 34° 26′.4 east of true south. The Methodist church spire bears 44° 46′.5 east of true south. The Episcopal church spire bears 61° 12′.3 east of true south.

Washington County, Abingdon, 1897.—Two granite posts, 6 inches square, were set to mark a true meridian line. The north stone is in the road which, if extended to the north, would pass between the reservoir and a private cemetery on top of Reservoir Hill. It is at the top of the first ridge south of the railroad and 2 meters west of the east fence. The south stone is between 150 and 200 meters distant, just below the summit of the hill and about 10 meters northeast of a small locust tree. The magnetic station is on the land of Gen. Arthur C. Cummings, directly in the prolongation of the line from the rod on the court-house cupola to the north meridian stone and 31 meters from the stone, in the eastern edge of a large grove. The mark or range used was the rod on the court-house cupola, and bears 41° 46′.6 east of true north.

Washington County, Bristol, 1898.—The station is in the grounds of the Southwestern Virginia Institute, 107 feet from the front line of the grounds and 60 feet to the right of the center of the walk leading to the main entrance of the building. It is marked by a Kentucky limestone projecting 3 or 4 inches above the surrounding ground and marked on top U. S. C. G. S. ⊙ 1898. A stone similar to the one marking the station, but with no lettering, was placed in the meridian 120½ feet south. One hundred and twenty-six feet north a hole was drilled in the granite steps of the institute building and filled with lead. The mark or range used was the tower of Kings College and bears 8° 20′.9 west of true south.

Wythe County, Wytheville, 1898.—The station is located on a hill back of Boyd's Hotel, and is marked by a white limestone marked on top U. S. C. G. S. ⊙ 1898. Due north, near the railroad, opposite the Mountain View Hotel, a blue limestone was set, thus marking the meridian. The mark or range used was the lightning rod on Mr. J. C. Allison's house, and bears 33° 02′ east of true north. The flag pole on Boyd's Hotel bears 22° 43′ west of true north.

WASHINGTON.

Clallam County, Classet, 1893.—A short distance to the east of the triangulation station near Classet village. It is on the second point west from Neah Bay, and is marked by a concrete pier 12 by 12 by 50 inches.

Clallam County, Dungeness, 1892.—About 20 feet east of the triangulation station, which is marked by a concrete pier rising about 7 feet above the surface of the sand. It is about 700 feet west of Dungeness light-house.

WASHINGTON—Continued.

Clallam County, Slip, 1893.—A short distance southeast of the triangulation station of that name, which is marked by a concrete pier. It is about a mile east of Slip Point, Clallam Bay.

Clallam County, Striped Peak, 1893.—Near the triangulation station of that name, which is marked by a concrete pier 12 by 12 by 50 inches. It is about a mile east of Crescent Bay.

Clallam County, Tatoosh, 1893.—Near triangulation station on Tatoosh Island, which is marked by a brick pier, 114 meters east of the light-house.

Clallam County, Waadah, 1893.—About 30 meters south of the triangulation station of that name on the northwest end of Waadah Island, on the northeasterly one of the two narrow points, marked by a concrete pier 50 inches high.

Clark County, Vancouver, 1895.—The station is on the military reservation, 124 meters from the quartermaster's depot, a little to the right of the line of the major's house. It is marked by a granite post having a pyramid-shaped top, projecting above ground. The mark or range used was the cross on the Episcopal church, and bears 4° 38′ east of true north.

Jefferson County, Port Townsend, 1894.—In the block immediately back of the one on which the United States Marine Hospital formerly stood, about 15 paces from Franklin street and 30 paces from Madison street. This block had been selected as the site for the new marine hospital.

King County, Seattle, 1900.—On the grounds of the University of Washington, about 6 miles from the city. Station was marked by a stone lettered U. S. C. & G. S. This stone is 121½ feet from the southeast edge of observatory, and 18½ feet from the eastern edge of board walk, about 600 feet north of the administration building.

King County, Seattle, 1900.—The station is in the old university grounds, 64 feet from the northeast corner of the university building and 72 feet 9 inches from the northwest corner of the same building.

Pacific County, Cape Disappointment, 1895.—The station is in the northwest corner of the yard surrounding the light-house keeper's dwelling, 21.2 feet from the corner of the house, 15.5 feet from the north fence (inner edge of top stringer), and 15.3 feet from the east fence.

Pierce County, Tacoma, 1894.—In Wright Park, 498½ feet due south of the astronomic station. It is marked by a granite block 4 inches square on top, projecting about 3 inches above the west walk, beside which it was planted. A second block was set 435½ feet farther south to mark a true meridian.

San Juan County, Bamboo, 1894.—Twenty-five or 30 meters southwest of the triangulation station on Point Caution, a low rocky point on the east side of San Juan Island.

San Juan County, Bellevue, 1894.—Is 25 or 30 meters northeast of the triangulation station of the same name on the west side of San Juan Island.

San Juan County, Clover, 1894.—Twenty-five or 30 meters west of north of the triangulation station on the east side of Henry Island at the north end of Mosquito Pass on a low gravelly point.

San Juan County, Doughty, 1894.—Twenty-five or 30 meters southeast of the triangulation station on the southwest point of Orcas Island.

San Juan County, Dry, 1894.—Twenty-five or 30 meters to the east of the triangulation station on the northwest point of Waldron Island.

San Juan County, Fairview, 1894.—Twenty-five or 30 meters north of the triangulation station in the southwest part of Orcas Island, on the southeast extremity of a low rocky point nearly abreast of the north end of Jones Island.

San Juan County, Goose, 1894.—Twenty-five or 30 meters east of north of the triangulation station on the highest part of Yellow Island near the southwest end.

San Juan County, Limestone, 1894.—Twenty-five or 30 meters to the east of the triangulation station on the west side of Orcas Island, nearly abreast of the south end of Waldron Island and about 80 meters north of Wheeler Brother's limekiln.

San Juan County, Mat, 1894.—Twenty-five or 30 meters northeast of the triangulation station on the southeast point of Shew Island.

San Juan County, Middleton, 1894.—Is 25 or 30 meters southeast of the triangulation station on Sandy Point, Waldron Island.

San Juan County, Morse Island, 1894.—Is 25 or 30 meters to the north of triangulation station on top of the rocky knob at the east end of Morse Island.

WASHINGTON—Continued.

San Juan County, Patos, 1894.—Twenty-five or 30 meters west of north of the triangulation station on Patos Island.

San Juan County, Root, 1894.—Twenty-five or 30 meters east of north of the triangulation station on the east side of West Sound, Orcas Island, about 1 mile north of Oak Island.

San Juan County, San Juan Island, 1897.—At the south end of San Juan Island at the south side of the entrance to Fish Creek. Station is marked by a fir tree cut off 3½ feet above ground.

San Juan County, Spiedon, 1894.—Twenty-five or 30 meters west of the triangulation station on the highest point of the bare hill at the east end of Spieden Island.

San Juan County, Shaw Island, 1895.—On a low spit on the north end of Shaw Island, about 5 meters from the east side of the spit. Station is marked by a fir post 4 feet high and 1 foot in diameter.

San Juan County, Slope, 1894.—Twenty-five or 30 meters northwest of the triangulation station on the point outside the west entrance to Friday Harbor, San Juan Island.

San Juan County, Windlass, 1894.—Twenty-five or 30 meters to the south of the triangulation station on the east side of Henry Island, opposite the entrance to Garrison Bay. It is on a sand and gravel spit about 200 meters south of the wood wharf.

Skagit County, Mount Vernon, 1900.—On the grounds of Mount Vernon graded school on the east side of the town. Station was marked by a cedar post 6 inches in diameter 60½ feet from the southwest corner of the school building and 86 feet from the southeast corner. The mark or range used was the western edge of the slanting roof of the house of Mr. Northcutt, just opposite the school building. Its true bearing is 39° 11′.2 west of north. The true bearing of the flag pole on the court-house is 63° 55′.2 west of north.

Snohomish County, Everett, 1900.—In the court-house grounds. Station was marked by a pine post 3 inches square, driven flush with the ground, 64.7 feet from the southwest corner of court-house, 123.5 feet from the northwest corner, and 32.5 feet south of flagstaff. The mark or range used was the flagstaff of the Jefferson School, of which the true bearing is 61° 55′ west of south.

Stevens County, Russell, 1901.—Russell is the name of a projected town just south of the international boundary and 2 miles south of Cascade, British Columbia. It lies on the south and west sides of Kettle River, in the bend made by the river to the south toward the Columbia. Observations were made at a point 97.9 feet east and 26.5 feet south of boundary monument No. 43, which is the second monument west of Kettle River. This monument is a pyramidal pile of stones 6 by 6 feet base and 6 feet high.

Thurston County, Olympia, 1894.—Triangulation station Howard on land of Mr. Gilmore, marked by a cedar block 12 by 12 by 60 inches, projecting about 3 feet above ground. A small observing hut was left standing. The mark or range used was the flagstaff on the Washington School, of which the true bearing is 9° 58′.1 east of south.

Wallawalla County, Walla Walla, 1887.—In the vacant lot at the southeast corner of Fifth and Poplar streets, opposite the front of St. Mary's Hospital.

Whatcom County, New Whatcom, 1900.—In the northwest corner of the grounds of the State Normal School, on a hill about 1 mile from the center of the town. Station is marked by a stone post lettered U. S. C. & G. S., set 24.8 feet from the north fence and 93.8 feet from the west fence. The mark or range used was the southwest corner of the stone coping around the first floor of the school building. Its true bearing is 67° 31′.8 east of south. The true bearing of the northeast corner of the same coping is 89° 48′.9 east of south.

WEST VIRGINIA.

Barbour County, Philippi, 1898.—Observations were made over the north monument of the meridian line at Philippi. It is located in the southern end of the town on a street running east and west. This monument is on the land owned by C. A. W. Smith, the third lot west from Main street. When the cross street is open, it will be on the curb of the sidewalk on the north side of the street. The south monument is about 2 000 feet south of the northwest corner of the lot owned by Hon. G. A. Dayton, M. C. It is located on the south side of a road running nearly east and west. These monuments are heavy sandstone posts sunk several feet in the ground, with their tops extending

WEST VIRGINIA—Continued.

several inches out of the ground. The centers of copper disks set in the centers of the tops of these monuments mark the ends of the true meridian line. The county surveyor, Mr. S. L. O'Neal, knows the location of these meridian monuments.

Berkeley County, Martinsburg, 1900.—Observations were made over the south stone of the meridian line established by the United States Geological Survey in 1898. This stone is at the head of the principal drive of Green Hill Cemetery, 13 feet west of the walk. It is a column of marble 40 by 8 by 6 inches, set 32 inches in the ground, with a copper plate in the center of the top. The mark or range was the north meridian stone, 575 feet distant, 30 feet east of the entrance gate and 4 feet from the fence. It is a similar marble column having an aluminum bolt to mark its center.

Boone County, Madison, 1900.—Observations were made over the south stone of the meridian line established by the United States Geological Survey in 1898. This stone is 315 feet a little north of east from the northeast corner of the Methodist Episcopal church, on land owned by Mr. Thompson. It is a sandstone column 42 by 8 by 8 inches, set 36 inches in the ground, with a copper plate in the center of the top. The north meridian stone is 237.8 feet distant, 1 foot south of south fence of St. Clair Hotel. It is similar to the south stone, but has an aluminum bolt to mark its center. The mark or range was the point of the gable of tower of the Methodist Episcopal church. This mark or range bears 84° 37′.5 east of true north.

Braxton County, Sutton, 1898.—Observations were made over the south monument of the meridian line at Sutton. This meridian line is marked with heavy sandstone posts, with copper disks in the centers of the tops of these posts. The centers of these disks mark the two ends of the meridian line. These meridian stones are sunk several feet in the ground, with their tops extending a few inches out of the ground. Messrs. J. B. Dunlop and G. A. Johnson, surveyors, residing in Sutton, know the location of these meridian stones. The south meridian stone is located on the east side of Main street, at the northeast corner of Main street and the first street north of the bluff in Upper Sutton. Main street runs approximately north and south. The north meridian stone is distant 843.2 feet from the south meridian stone, on the same side of Main street, and is on the north side of the second cross street north of the south meridian stone.

Cabell County, Huntington, 1898.—Observations were made over the north monument of the meridian line at Huntington. This meridian line is marked with heavy freestone posts, with copper disks in the centers of the tops of these posts. The centers of these disks mark the two ends of the meridian line. These meridian stones are sunk several feet in the ground, with their tops extending a few inches out of the ground. The north meridian monument is located near the southwest corner of a new school building at the southeast corner of Fifth avenue and Sixth street. The south meridian stone is about 1 000 feet distant from the north meridian monument, in what is at present a field, with an orchard just beyond the field. The county surveyor, Mr. J. H. Sanborn, knows the location of these meridian stones.

Clay County, Clay, 1900.—Observations were made over the north stone of the meridian line established by the United States Geological Survey in 1898. This stone is in the front garden of the house occupied by Mr. Davenport, just west of the Baptist church. It is a sandstone column 36 by 8 by 8 inches, set 36 inches in the ground, with its center marked by an aluminum bolt. It is 73 feet from the southwest corner of the church and 83.5 feet from the northwest corner. The south meridian stone is 365.2 feet distant, at the corner of Main street and third alley. It is a column of sandstone 42 by 8 by 8 inches, set 36 inches in the ground, with a copper plate in the center of the top. The mark or range was the point of the north gable on the west side of Hotel Stephenson, between two chimneys. This mark or range bears 14° 19′.0 east of true south.

Doddridge County, West Union, 1900.—Observations were made in the grounds south of the public school 60.6 feet from the fence and 65.4 feet slightly to the west of south of the south stone of the meridian line established by the United States Geological Survey in 1898. This stone is a sandstone column 45 by 8 by 8 inches, set 39 inches in the ground, with a copper plate in the center of the top. It is 160 feet from the southwest corner of the school building and 169 feet from the southeast corner. The mark or range was the point of the tower of a white wooden church just across the ravine which separates the hill on which the school stands from the main part of town. This mark or range bears 55° 37′.8 west of true north from the stub marking the magnetic station.

WEST VIRGINIA—Continued.

Fayette County, Fayetteville, 1900.—Observations were made over a point east of the south stone of the meridian line established by the United States Geological Survey in 1898. This south stone of the Geological Survey is set in the ditch on the south side of Maple avenue, which runs in a northeast direction on the southeast side of the court-house. It is between the Journal printing office and the church, and 206 feet from the northeast corner of the former. The Coast and Geodetic Survey station of 1900 is in the vacant field almost 75 feet due east of this south stone of the Geological Survey. The distances from the fences on the northwest and southwest boundaries of this vacant field were 45 and 84 feet, respectively. The mark or range was the northwest edge of the northwest chimney of a white house seen immediately to the right of the Altamont Hotel. This mark or range bears 4° 06′.5 east of true south. The ball on the court-house bears 77° 21′.3 west of true south. North stone of Geological Survey bears 9° 53′.3 west of true north.

Grant County, Glebe, 1900.—Observations were made over a small cross in a limestone rock, planted about 20 inches in the ground and projecting 3 inches above the surface of the ground. This rock is in the yard of the county poorhouse, being 66.8 feet from the southwest corner of the foundation of the main building. This county poorhouse is about 6 miles west of Petersburg and 3 miles east of Hopeville. The mark or range was the northwest edge of the main building at the poorhouse. The mark or range bears 6° 17′.5 east of true north.

Grant County, Falls, 1900.—Observations were made over a point on a bank about 4 feet above the county road, in a small cleared spot near a fork in the road, one branch going to the ford below the falls at the east end of the gap, and the other one a small iron bridge en route to the Falls post-office, which is in sight. The brick church, in an oak grove, is 302 feet distant. The center of the road is distant 42 feet. A large sycamore, locust, double white oak, and a small sycamore are distant, respectively, 24.1, 31.3, 54.2, and 31.5 feet. The mark or range was the southwest corner of the brick church. This mark or range bears 58° 11′.8 east of true south.

Greenbrier County, Lewisburg, 1900.—Observations were made over the south stone of the meridian line of the United States Geological Survey established in 1898 in the grounds of the boys' school building, formerly Major Lee's Military Academy. This south stone is 12 feet from a large oak tree and 76 feet from the northeast corner of the school building, and is a column of sandstone 42 by 8 by 8 inches, set 36 inches in the ground. The center of a copper plate set in its top marks the point. The north stone is also a column of sandstone, distant 323 feet from the south stone, in the northeast corner of the school yard. An aluminum bolt set in the top of this stone marks the point, and it was used as the mark or range.

Hampshire County, Romney, 1900.—Observations were made over the north stone of the meridian line established by the United States Geological Survey in 1898. This north stone is a column of limestone 39 by 10 by 6 inches, set 28 inches in the ground, with an aluminum bolt in the center of the top of the stone which marks the point. It is located in the grounds of the Deaf, Dumb, and Blind Institute, on the line of the fence, 21 feet east of the fence running north, and 645 feet north of the south stone of this meridian line. This south stone is a column of marble, also set in the grounds of this institute, north of the main building, in the southeast corner of the baseball grounds. The center of a copper plate set in the top of this stone marks the point, which was used as a mark or range.

Hardy County, Moorefield, 1900.—Observations were made over the south meridian stone established by the United States Geological Survey in 1898. It is located on land owned by Gilkeson, on a level plateau north of the county road, and near the line of a rail fence, about one-half mile east of the town. This post consists of a column of marble 44 by 7 by 7 inches, set 37 inches in the ground. The center of a copper plate set in the top of this stone marks the point. The north meridian stone is distant 826 feet from the south stone and is located 3 feet south of the south fence of the cemetery. It is also a column of marble with an aluminum bolt set in the top of this post, which was used as a mark or range.

Harrison County, Clarksburg, 1898.—Observations were made over the south monument of the meridian line at Clarksburg. This meridian line is marked with heavy sandstone posts, nicely dressed, with copper disks in the centers of the tops of these posts. The centers of these disks mark the two ends of the line. These monuments are sunk several feet in the ground, with their tops extending a few inches out of the ground. The south monument is in the grounds of the public-school building,

WEST VIRGINIA—Continued.

170 feet east of the school building, and in a few feet of the point over which observations were made in 1880. The north monument is across the river, about 800 feet distant from the south monument, near a bridge crossing the Baltimore and Ohio Railroad tracks. Mr. J. H. Davis, civil engineer, knows the location of these meridian monuments.

Jackson County, Ripley, 1900.—Observations were made over a point 42.4 feet due north of the south stone of the meridian line established by the United States Geological Survey in 1898. This south stone is in the southwest corner of the court-house grounds in front of the Hassler Hotel. It consists of a column of sandstone 42 by 8 by 8 inches, set 36 inches in the ground. The center of a copper plate set in the top of this stone marks the point. The north meridian stone is distant 334.5 feet from the south meridian stone and is set in the northwest corner of the court-house grounds. An aluminum bolt set in the top of this stone was used as a mark or range.

Jefferson County, Charlestown, 1900.—Observations were made first over the north stone of the meridian line established by the United States Geological Survey in 1898. This stone consists of a column of limestone 30 by 10 by 7 inches, set 28 inches in the ground. An aluminum bolt set in the top of this stone marks the point. This stone is distant 76.5 feet from the southeast corner of a harness factory which bears south 60° east.

Observations were also made over the south stone of this meridian line of the Geological Survey, located in the corner of the wall at the northeast corner of the Methodist Episcopal church. It consists of a column of sandstone with a copper plate set in the top of it. The center of this plate marks the point. The meridian stones are 767 feet distant from each other, and they were used as ranges or marks.

Kanawha County, Charleston, 1900.—Observations were made as nearly as possible over the point occupied by Mr. E. Smith of the United States Coast and Geodetic Survey. It is located on Capitol Hill, which rises behind the C. & G. S. R. R., and may be reached by steps at the end of the capitol street. The meridian stones planted by Mr. Smith could not be used because they were too far away to be seen through the smoky atmosphere. The range or mark was the point of the spire of the capitol building. This mark or range bears 55° 49′.1 west of true south.

The point is located on the property of Mr. J. F. Savage, and is about 140 feet above the general level of the town. It is not marked, as the grade is to be changed. Seventy-five and one-fourth feet south of this point, in the lawn about Mr. Savage's house, a heavy sandstone meridian monument was set, with a copper disk in the center of its top. The center of this copper disk marks the point. Two similar monuments were also set in this meridian line at Charleston. One of these monuments is on a hill about 1 mile north of the monument in Mr. Savage's yard, and is located on land belonging to Mr. Jefferson Savage. The last of the three monuments is on the side of a hill about 1 mile south of the first monument, i. e., the monument in Mr. J. F. Savage's yard. These meridian monuments are sunk several feet in the ground, with their tops extending a few inches out of the ground. The county surveyor knows the location of these monuments.

Kanawha County, Ryan, 1892.—The station is about 2 miles northeast of St. Albans, on land owned by Mr. J. Ryan. It is located on the highest part of the ridge. It is marked by a draintile filled with cement. Four other marks (draintiles) are placed around the central one, distant 6 feet.

Kanawha County, St. Albans, east base, 1893.—The station is about 2 miles east of St. Albans railway station on land owned by Mr. Samuel Shrewsberry. It is about 150 feet west of the bank of Two and three-quarter Mile or Swindlers Creek. It is about 60 feet back or north of the railway. It is marked by a stone monument projecting about 1 foot above the surface of the ground.

Kanawha County, St. Albans, west base, 1893.—The station is 60 feet north of the north rail of the main line of the Chesapeake and Ohio Railroad track, in the fence line of the west side of First street. This fence forms the eastern boundary of Mr. Daniel J. Lewis's property. The station is marked by a stone monument projecting about 1 foot above the surface of the ground.

Lewis County, Weston, 1898.—Observations were made over the south monument of the meridian line at Weston. It is located in the grounds of the West Virginia Hospital, in front of the south wing of the main building. The north meridian monument is in front and a little to the south of the center of the main building, and is just south of the driveway leading to the main entrance. These monuments are made from heavy blocks of blue sandstone. They have copper disks set in the centers

of their tops. The centers of these disks mark the two ends of the meridian line, which is about 302 feet long.

Lincoln County, Hamlin, 1900.—Observations were made over the south stone of the meridian line established by the United States Geological Survey in 1898. It consists of a column of sandstone 43 by 8 by 8 inches, set 36 inches in the ground. The center of a copper plate set in the top of this post marks the point. This stone is located on Main street a few paces north of Hamlin Hotel, between the sidewalk and the road. The mark or range was the center of an iron cross on the north wall of the post-office, a brick building on Main street, farther to the south. This mark or range bears 8° 22′.7 west of true south.

Logan County, Logan, 1900.—The south stone of the meridian line established by the United States Geological Survey in 1898 could not be used on account of its proximity to a brick building. Observations were made over a wooden stub on the top of a spur behind the Hotel Logan and approached through the yard of that hotel. This spur is about 70 or 80 feet above the general level of the town, and it is the property of Mr. Peck. This wooden stub is the only spot on this spur from which the north stone of the Geological Survey meridian can be seen. This north stone is set on a steep slope just outside of the cemetery, 5 feet east of the east fence of this cemetery. It is very inaccessible. The mark or range used was the point of the spire of the church, almost exactly west of the magnetic station on the street behind the Buskirk House. This mark or range bears 72° 31′.2 west of true south.

McDowell County, Welch, 1900.—The meridian stones established by the United States Geological Survey in 1898 could not be used. Observations were made over a wooden stub set in the open space in the court-house lot on the west side of this meridian line, 89.6 feet from the south stone of this meridian line, 64.1 feet from the northwest corner of the court-house tower, and 42.3 feet from the center of an apple tree very close to the meridian line. The mark or range used was the edge of the chimney of the most distant white frame house seen from the station, up the valley, when looking southward. This mark or range bears 20° 52′.7 west of true south. The north meridian stone bears 11° 06′.8 east of true north.

Mercer County, Princeton, 1900.—The meridian line established by the United States Geological Survey in 1898 could not be used on account of its proximity to wire fences, etc. Observations were made over an oaken stub located at a point between the south stone of the Geological Survey meridian and the path leading from the main road to the high school. This stub is distant 48.2, 32.1, and 23 feet, respectively, from three trees on the south side of the walk leading from the gate to the school, and from the east fence of the grounds it is distant 58.4 feet. The mark or range used was the ball on the spire of the church which is seen from this stub in front of the court-house. This mark or range bears 16° 01′.4 west of true south. The south stone of the Geological Survey bears 24° 07′.2 west of true south. The north stone of the Geological Survey bears 7° 19′.0 west of true north.

Mineral County, Keyser, 1898.—Observations were made over a large Cumberland sandstone monument which is located in the grounds of Mr. W. E. Crooks' residence, and near the circle in front of his house. This monument is sunk several feet in the ground, with its top extending a few inches out of the ground. The center of a copper disk set in the center of the top of this stone marks the point. No other meridian monument was set up at this place. The United States Geological Survey had already established a meridian line in this town, but it was not used on account of its proximity to fences, which are now near the meridian monuments. The range or mark at this station was the trunk of a tree on a distant hill. This range or mark bears west of true south 0° 10.′8.

Mingo County, Williamson, 1900.—The meridian stones established here by the United States Geological Survey in 1898 could not be used. Observations were made over a wooden stub located at a point between these two stones a few yards to the west of the meridian line, on a low ridge on the hillside running from the north Geological Survey stone down in the ravine which separates these two stones. It is 56 paces from the north stone almost in the direction of the court-house. The mark or range used was the spire of the Presbyterian church. This mark or range bears 9° 56′.6 west of true south.

WEST VIRGINIA—Continued.

Monongalia County, Morgantown, 1900.—The meridian stones established by the United States Geological Survey in 1898 in the university campus could not be used. Observations were made over a tack in wooden stub 109.6 feet from the south stone of this meridian line, 107.6 feet from the western fence line of the campus, and 74.5 feet north of the south fence of the campus. The marks or ranges used were the tip of the court-house tower and the steeple on the Methodist church. The tip of the court-house tower bears 4° 54′.2 west of true south. The steeple of the Methodist church bears 11° 14′.5 west of true south. This point was occupied twice during the year for magnetic observations.

Monroe County, Alderson, 1898.—Observations were made over a monument located in the grounds of the Alleghany Collegiate Institute, on the south side of High street, between Church and Monroe streets, and not many feet distant from the point where observations were made in 1881. It is near the stone wall on High street. This monument consists of a large sandstone post sunk several feet in the ground, with its top extending a few inches out of the ground. The center of a copper disk in the center of the top of this stone marks the point. No other meridian stone was set up at this place and the mark or range used is not described. Mark 12° 29′.9 east of north.

Morgan County, Pawpaw, 1899.—The station is in the large field south of the railroad station, near the frame dwelling house on the hill. It is 37 feet from the northwest corner of the fence, 67 feet from the northeast corner, and 29 feet in front of the gate.

Nicholas County, Summersville, 1900.—Observations were made over the south stone of the meridian line established by the United States Geological Survey in 1898. It is situated in the public school grounds 10 feet north of the south fence. This meridian stone consists of a column of sandstone 42 by 8 by 8 inches, set 36 inches in the ground. The center of a copper plate set in the top of this stone marks the point. The mark or range used was the ball on the tower of the court-house. This mark or range bears 61° 43′.9 west of true south.

Ohio County, Wheeling, 1898.—Observations were made over the north monument of the meridian line on Zane's Island, near Wheeling. This north monument is inside the race course on Zane's Island near its northwest side. The south monument is also inside this race course, about 450 or 500 feet due south of the north monument. These meridian monuments are heavy sandstone posts, sunk several feet in the ground, with their tops extending several inches out of the ground. The centers of copper disks set in the centers of the tops of these stones mark the ends of this meridian line.

Pendleton County, Brushyrun, 1900.—Observations were made over a point in a pasture field 261.3 feet southwest of the stone chimney on Charles Mallon's house, on the top of a slight rise. It was 153 feet southeast of the Franklin road, 190 feet south of a double cherry tree, and 142 feet east of a walnut tree, both of the above trees being near the side of the road and a worm fence. The location is about 14 miles south of Petersburg and about 2¼ miles north of the iron bridge crossing the South Fork, and on the north side of the ridge or watershed between Brushyrun and the South Fork. The mark or range used was the southwest edge of this stone chimney, just below the edge of the capstone. This mark or range bears 48° 56′.8 east of true north.

Pendleton County, Cave, 1900.—Observations were made in a pasture field owned by Peter J. Moyers. The point is 64.4 feet north of the county road leading from Franklin to Monterey. This point is distant 244.6 feet from the northwest edge of Moyers's house, which was used as a mark or range for the magnetometer. It is distant 71.5 feet from a very large oak tree, and 52 feet from a small rivulet, and 200 feet from a large stream which crosses the road. This pasture is 9½ miles south and west of Franklin, at Cave post-office. The cave proper is one-half mile farther south, and north of the road about 300 feet. The angle between the northwest corner of the Moyers house and a bold point of rock on top of the mountain southeast of the station was found to be 122° 36′.1. The mark or range used was the northwest corner of the Moyers house. This mark or range bears 25° 32′.0 east of true north.

Pendleton County, Franklin, 1900.—Observations were made over a point 26.77 feet north of the south meridian stone established by the United States Geological Survey in 1898, in the meadow owned by Mr. W. H. Boggs, east of the town. This meridian stone consists of a column of limestone 44 by 7 by 7 inches, set 38 inches into the ground. The center of a copper plate set in the top of this stone marks the point. The mark or range used was the cupola of the schoolhouse. This mark or range bears 4° 58′.6 west of true north.

WEST VIRGINIA—Continued.

Pocahontas County, Marlinton, 1900.—The meridian stones erected by the United States Geological Survey in 1898 could not be used. Observations were made over a point in the court-house yard, in the southeast end of the town. It is distant 62.9 feet from the south meridian stone of the meridian line established by the United States Geological Survey, and is distant 50 feet from the north corner of the brick court-house. It is also distant 53.8 and 55.2 feet, respectively, from the iron fences northeast and northwest of this point of observation. The mark or range used was the spire of the Methodist church. This mark or range bears 46° 56′.7 west of true north.

Pocahontas County, Travelers Repose, 1900.—Observations were made over an undressed sandstone post set on an old breastwork of 1862 on the west point of a hill north of the Staunton and Parkersburg pike and about 800 feet east of the ford over a branch of the Greenbrier River. It is east of P. D. Yeager's house. The lightning rod near the north chimney of P. D. Yeager's house was used as a mark or range. This mark or range bears 77° 51′.4 west of true north. The center of a brick chimney of a church in the valley bears 62° 37′.1 west of true south.

Preston County, Foley Mountain, 1897.—Near Brookside, W. Va. The station is on the top of the mountain in the clearing for the meridian line 25.05 feet, 35° 01′.2 west of north from L. A. Bauer's meridian station.

Preston County, Kingwood, 1900.—Observations were made over the south stone of the meridian line established by the United States Geological Survey in 1898. This stone is located south of the livery stable on Mr. McRae's land, and is 3 feet north of the south fence. It consists of a column of granite 44 by 8 by 8 inches, set 39 inches in the ground. The center of a copper plate set in the top of this stone marks the point. The mark or range used was the intersection of the northwest edge of the western chimney and roof of a house to the east of south. This mark or range bears 3° 43′.6 east of south, as determined by observations on north meridian stone of the meridian line of the United States Geological Survey, which is in the grounds of the Hotel Gordon.

Putnam County, Winfield, 1900.—Observations were made over a point 137 feet true north of the south stone of the meridian line established by the United States Geological Survey in 1898. This south meridian stone is located in the court-house grounds, opposite the jail. It consists of a column of sandstone 42 by 8 by 8 inches, set 36 inches in the ground. The center of a copper plate set in the top of this stone marks the point. The mark or range used was the north stone of this meridian line of the United States Geological Survey, located on the north side of the main street near the back of Hanly & Craighill's store. This stone consists of a column of sandstone 36 by 8 by 8 inches, set 36 inches in the ground. An aluminum bolt set in the top of this stone marks the point.

Raleigh County, Beckley, 1900.—Observations were made over a point 78.5 feet due north of the south stone of the meridian line established here by the United States Geological Survey in 1898. This stone is located on the north side of the walk and the south side of Main street, on the west side of the town, opposite the residence of Mr. Anderson. It consists of a column of sandstone 42 by 8 by 8 inches, set 36 inches in the ground. The center of a copper plate set in the top of this stone marks the point. The mark or range used was the center of the north meridian stone. It is located on a hillside, across a small ravine 1,249.1 feet north of the south stone of this meridian line. It consists of a sandstone column, 36 by 8 by 8 inches, set 36 inches in the ground. An aluminum bolt set in the center of this stone marks the point.

Randolph County, Beverly, 1898.—Observations were made over the south meridian monument of the meridian line at Beverly. It is located in the yard of Dr. G. W. Yokum, in the south end of the town, on the west side of Main street. The north meridian monument is on the east side of Main street, 350 feet distant from the south meridian monument. These monuments are heavy sandstone posts, sunk several feet in the ground, with their tops extending several inches out of the ground. The centers of the copper disks set in the centers of the tops of these stones mark the ends of this meridian line.

Randolph County, Mingo, 1900.—Observations were made over a point located in a lot owned by S. H. Wood, east of his house, and south of his store and of the county road. This station was upon the point of a little rise about 3 feet from the edge of this lot, between two little rivulets. It is distant from the point of this rise 13 feet, and 50.7 feet distant from the southwest corner of a stone spring

WEST VIRGINIA—Continued.

house. It is distant, respectively, 41.65, 69.20, and 73.0 feet from a small apple tree to the east at the foot of a steep bank, from an apple tree to the west near a picket fence, and from an apple tree to the southwest near a subterranean cellar. The mark or range used was the point of the church tower of the Presbyterian church. This mark or range bears 0° 35′.4 east of true south.

Randolph County, Pickens, 1898.—Observations were made over the center of a copper disk set in a triangular rock. This rock is east of the railway, about one-fourth of a mile distant from it, and about 100 feet north of the road running east from the railway station. It is located on land belonging to Mr. James Pickens, and in the rear of a house owned by Mr. W. R. Thomas. No meridian monuments were set up at this place. There are no prominent or permanent objects which could be used as ranges or marks.

Ritchie County, Harrisville, 1898.—Observations were made over the south monument of the meridian line at Harrisville. It is located on the farm of Mr. John Hulderman, about three-fourths of a mile from the court-house, and nearly south of it. This monument is on a ridge just above the farmhouse, and about 800 feet from it. The north monument is about 1 mile northof the sou th monument, near the boundary fence between the lands of Dr. W. E. Tolbott and Mr. E. C. Fox. These monuments are heavy sandstone posts sunk several feet in the ground, with their tops extending several inches out of the ground. The centers of the copper disks set in the tops of these stones mark the ends of this meridian line.

Summers County, Hinton, 1900.—Observations were made over the south stone of the meridian line established by the United States Geological Survey in 1898. It is located in the grounds of the court-house, by the side of the path near the southeast corner of the square. It consists of a column of sandstone 42 by 8 by 7 inches, set 36 inches in the ground. The center of a copper plate set in the top of this stone marks the point. The mark or range used was the center of the north stone of this meridian line. It is located opposite the front door of Graham's store, on the south side of the sidewalk, 10 feet east of Second avenue and 307.3 feet north of the south stone of this meridian line. The center of an aluminum bolt set in the top of this stone marks the point.

Taylor County, Grafton, 1898.—No meridian monuments were erected here to mark the true meridian line, on account of the improvements to be made in the locality where the observations were made. The point over which the observations were made is unmarked. It is located on a hill near a large rock, which is a very prominent object. This hill is south of the railway station, and Pike street runs near this rock. The United States Geological Survey has established and marked a true meridian line in this vicinity. The meridian posts could not be used on account of their proximity to fences, but they can be extended. Mr. John E. Stone, who lives in this vicinity, is familiar with these monuments.

Tucker County, Hendricks, 1898.—Observations were made over a cross on a natural rock located on the lands of the United States Leather Company. The rock is reached by crossing the bridge over Little Black Fork River, at the north end of the town. It is about 1 000 feet beyond the bridge, on the north side of the road, fully 1 200 feet southwest of the West Virginia Railroad, and about the same distance north of the Dry Fork Railroad. The mark or range used bears east of true north 17° 29′.8. The southwest corner of bridge bears east of south 68° 16′.2. The southeast corner of bridge bears east of south 69° 20′.2.

Upshur County, Buckhannon, 1898.—Observations were made over the north monument of the meridian line at Buckhannon. This monument is located in the grounds of the West Virginia Conference Seminary. It is located in the open space in front of the main building of the seminary and in the northwest corner of this lot. The south monument of this meridian line is about 450 feet south of the north monument, between two brick buildings and near a brick walk. Mr. W. G. L. Lathen and Mr. L. A. Wallins know the location of these stones. These monuments are heavy sandstone posts, sunk several feet in the ground, with their tops extending several inches out of the ground. The centers of copper disks set in the centers of the tops of the monuments mark the ends of the meridian line.

Wayne County, Dunlow, 1898.—Observations were made over the north monument of the meridian line at Dunlow. This north meridian monument is located in the pasture lot adjoining the residence of Mr. Thomas Linsley, the superintendent of the Guyandot Coal Land Association. It is about 300 feet from the railway and about 150 feet from the bank of Twelve Pole Creek. The

WEST VIRGINIA—Continued.

south meridian monument is on the slope of a hill across the railway. These monuments are heavy sandstone posts sunk several feet in the ground, and with their tops about even with the surface of the ground. The centers of the copper disks set in the centers of the tops of these monuments mark the two ends of this meridian line. Mr. Thomas Linsley knows the location of these monuments, and he furnished them.

Wayne County, Wayne, 1898.—Observations were made over the north monument of the meridian line at Wayne. This north meridian monument is on the hill east of the town, on property belonging to Prof. T. B. McClure, in the open lot just east of and above his school building. The south meridian monument is due south of the north monument, and about a mile distant from it, on land belonging to Mr. Boswell Ferguson. Mr. Joe Plymale and Mr. H. Atkins, surveyors, are familiar with the location of this monument. These monuments are heavy sandstone posts sunk several feet in the ground, with their tops extending a few inches out of the ground. The centers of the copper disks set in the centers of the tops of these stones mark the two ends of this meridian line.

Webster County, Addison, 1900.—Observations were made over a point 33.71 feet north of the south stone of the meridian line established here by the United States Geological Survey in 1898. It is located on the grounds of the Webster Springs Hotel, 6 feet north of the south fence. It consists of a column of sandstone 42 by 8 by 8 inches, set 36 inches in the ground. The center of a copper plate set in the center of this stone marks the point. The mark or range used was the ball on the court-house. This mark or range bears 7° 46′.0 west of true north.

Wood County, Parkersburg, 1898.—Observations were made over the north monument of the meridian line at Parkersburg. This north meridian monument is in the city park, formerly the old county fair grounds. It is located in a clump of trees northeast of the old "grand stand." The south meridian monument is 697 feet due south of the north monument, and is also in the city park, near the superintendent's house. These monuments are very heavy Cleveland sandstone posts, sunk with their tops extending a few inches out of the ground. The centers of copper disks set in the centers of the tops of these monuments mark the two ends of this meridian line. Mr. J. S. A. Farrar, city engineer, knows the exact location of these monuments.

Wyoming County, Baileysville, 1900.—Observations were made over a wooden stub located in a field behind the little white church, and on the north side of this church. It is distant 193 feet from the northwest corner of this church, and 70 feet from the center of the lumber tramway which crosses the field between the church and this stub. The mark or range used was the point of the west gable of Bailey's Hotel. This mark or range bears 78° 40′.6 east of true south.

Wyoming County, Oceana, 1900.—The meridian line established here by the United States Geological Survey in 1898 could not be used. Observations were made over a wooden stub located on the low ridge between the south stone of the Geological Survey and the river. It is distant, respectively, 148, 116, and 128½ feet from the consecutive trees on the water's edge nearest the station; one is an oak, one a water birch, and one a beech tree. It is 60 or 70 yards west of this meridian line of the Geological Survey. The south stone is south of the town, on land owned by Mrs. M. A. Conley. The mark or range used was the point of the Methodist church tower. This mark or range bears 28° 01′.9 west of true north.

WISCONSIN.

Brown County, Green Bay, 1891.—The station is in the fair grounds, east of the city, in the open space just east of the race track, south of "White Pine Grove" and north of the exposition building. It is 63.1 feet from the outer edge of the race track, and is also 74.5 feet, 59 feet, and 57 feet, respectively, from the trunks of the three south pine trees of the grove just north of the station. It is marked by a small terra cotta pipe sunk even with the surface of the ground.

Buffalo County, Alma, 1893.—The station is 516 feet east and 50 feet north of the west quarter-section post in section 26.

Buffalo County, Maxville, 1893.—The station is 439 feet east and 618 feet north of the south quarter-section post in section 21.

Crawford County, Prairie du Chien, 1900.—The station is in the southwest corner of the court-house grounds, 22 feet 5 inches from the inner edge of the sidewalk to the south and 24 feet 9 inches from the diagonal brick walk on the grounds. It is marked by a limestone post 7 inches square,

WISCONSIN—Continued.

lettered on top U. S. C. S., and sunk flush with the surface of the ground. The mark or range used was the southwest edge of the chimney on the third house from the corner on the east side of the street bounding the court-house on the east, and bears 57° 40′.8 east of true south.

Dane County, Madison, 1900.—The station is in the second meadow north of the main barn, and is west of the lane of the university farm. It is 185.5 feet north of the wire fence between the two meadows. The line joining the northeast corner of the main barn and the magnetic station intersects this wire fence at a point 205.5 feet west of the lane. It is marked by a Bedford limestone post 8 inches square, with its top 6 inches below the surface of the ground. The dome of the main asylum building bears 14° 14′.2 east of true north.

La Crosse County, La Crosse, 1900.—The station is inside the race course of the fair grounds, about 1 mile east of the town. It is marked by a Bedford stone post 8 inches square lettered on top U. S. C. & G. S., and sunk flush with the ground. This stone is 81 feet 8 inches to the east from the race-track fence and 134 feet 1 inch to the northeast from the northeast corner of the judge's stand. The mark or range used was the southeast corner of the main exhibition building, and bears 24° 55′.1 west of true south

Milwaukee County, Milwaukee, 1888.—The station is just west of the North Point light-house, 111 feet 3 inches from the granite post marking the southwest corner and 57 feet 6 inches from the granite post marking the northwest corner of the boundary of the light-house grounds. It is marked by a wooden stub.

Pierce County, Ellsworth, 1893.—The station is on land owned by Mr. Leonard, 129 meters west of the farm division fence and 133.3 meters south of the quarter-section line.

Pierce County, Maiden Rock, 1893.—The station is on the farm of Col. C. O. Rask, 560 feet north and 41 feet west of the center of section 21 (T. 24 R. 16 W). It is nearly in front of his house, just west of the wagon road.

Price County, Prentice, 1891.—The station is on the bluff on the bank of Jump River, at the foot of Park street. It is almost in line with the northern edge of this street, being 8.42 meters from the stub marking the corner of the foot of the street on the north side and 20.50 meters from the stub which marks the corner on the south side. It is marked by an elm post sunk even with the surface of the ground.

WYOMING.

Crook County, Mileposts 283, 284, 1882.—The station is on the line between these posts.

Crook County, Little Missouri River, 1882.—The station is 576.3 feet west of milepost No. 329, of the north boundary.

Crook County, northeast corner of Wyoming, 1882.—The station is the northeast corner of the State, and is marked by a stone post completely covered with earth, thus forming a small mound.

Sheridan County, Milepost 185, 1882.—This post is near the Fort Custer wagon road, just east of it.

Yellowstone National Park, Milepost 42, 1882.—The milepost is on the west side of the summit of a hill in the valley of Slough Creek.

Yellowstone National Park, Yellowstone Lake, 1892.—The station is 69.14 meters north and 0.025 meters west of the longitude pier in the edge of the pine woods, about 10 meters west of the road from Lake Hotel to Canyon Hotel, and about one-half mile northeast from Lake Hotel. Observations were also made at a point 334.2 meters south of the pier, showing a strong local disturbance.

BRITISH COLUMBIA.

Carson, 1901.—Observations were made at a point about 1 450 feet west of Kettle River, and almost in line with the south side of a 200-foot bridge crossing the stream. It is 12.7 feet west of boundary monument No. 53, and is marked by an iron post placed there to mark the azimuth station and the south end of a meridian line.

Columbia River at Canadian Boundary, 1901.—Observations were made at a point east of the river and about 400 feet due north of Boundary post-office, Washington. The mark or range used was the azimuth station at the Boundary, and bears 62° 11′.4 west of true south.

BRITISH COLUMBIA—Continued.

Comox, 1900.—Observations for declination and dip were hastily made at Union Spit, near Comox, while steamer stopped for coal. The observations were repeated in front of the hotel at Union Bay.

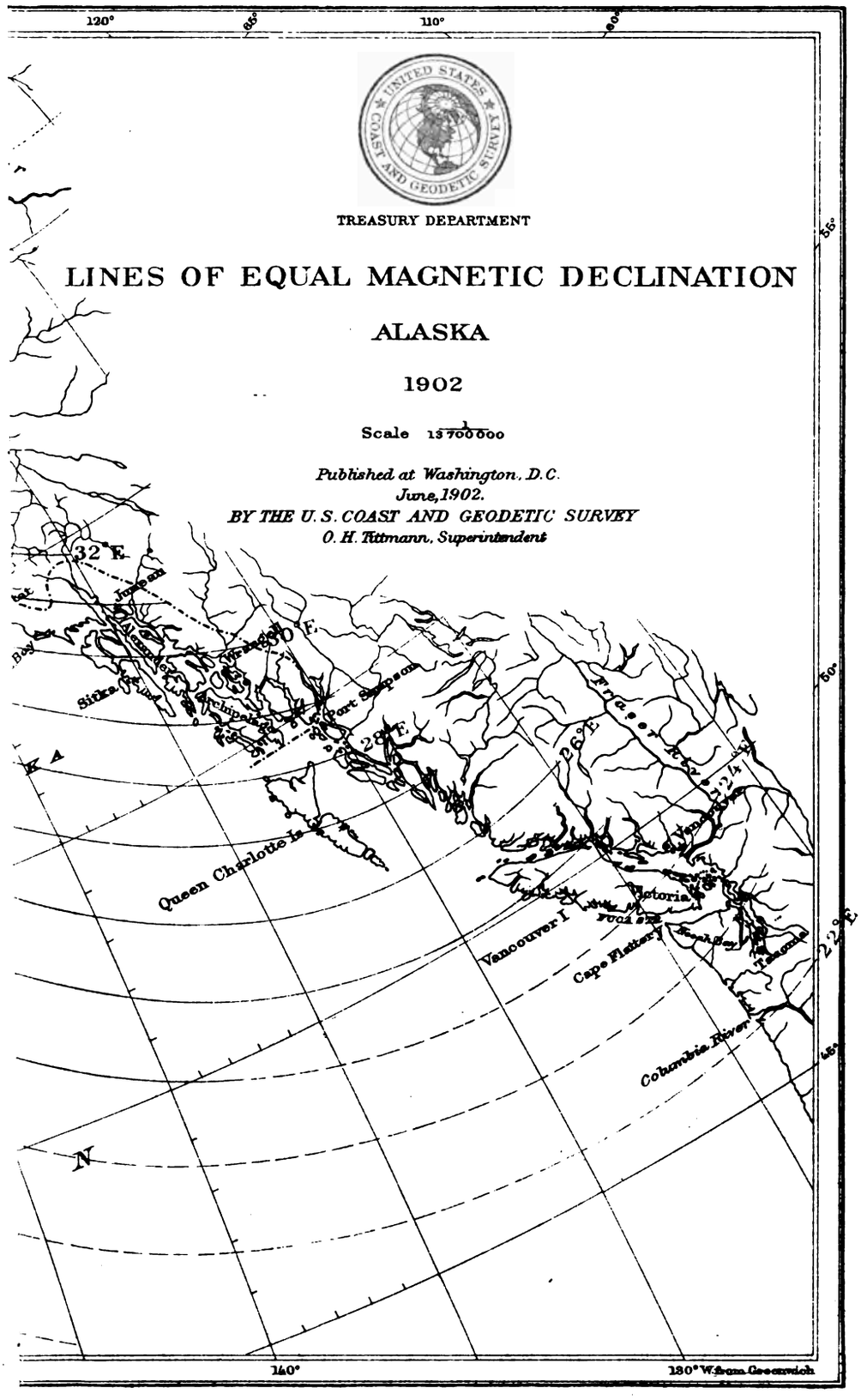
Lion Point, 1895.—Observations were made near the head of Portland Canal, on a prominent rocky knoll covered with moss, brush, and stumps of trees, near the extreme end of the point, about 20 meters back of high-water mark and 7 meters above mean high water. The instrument was mounted on a wooden post 10 inches in diameter and firmly set into the ground 20.1 meters east of north from a brick pier capped with a granite block with the letters U. S. C. & G. S., 1895, cut into the top surface.

Midway, 1901.—The station was on the west side of Boundary Creek exactly in line between two stone piles or monuments, No. 66 on the high mountain a mile west, and No. 63 on the green hill three-fifths of a mile east. This spot was used also as an azimuth station, and as such has been marked with an iron post 3½ inches in diameter and 4 feet long, with a brass cap inscribed S. Meridian 1901.

Port Simpson, 1895.—This station is located on the west side of the hill, just east of the town, and is a little north of east of the Hudson Bay Company's store, and distant about 300 meters therefrom. A brick pier about 3 feet high marks the astronomical station. This is capped by a granite block, lettered on top U. S. C. & G. S., 1895. Magnetic observations were made at a point 23.30 meters due north of the center of this pier

Silicia Creek, 1901.—The station is on the left bank of Silicia Creek, a tributary of the Chilliwack River. It is 32 miles from Chilliwack, British Columbia, reached by wagon road and trail. The wagon road extends to McGuire's ranch, 9 miles from Chilliwack, and the remaining distance is by trail. The trail follows the right bank of the Chilliwack River, crossing that stream about a hundred yards above the mouth of Silicia Creek. Six miles farther on it crosses that creek and follows the left bank up to the station. About 50 yards above the station it crosses to the right bank of Silicia Creek. Glacier Creek empties into Silicia Creek about half a mile below the station. The station is on a bench about 60 feet above the creek, and the mountain slopes up steeply from it to the south and west. The whole region is densely wooded with cedar, fir, and hemlock. Magnetic observations were made at a point about 50 meters due north of an iron pipe set upright in the ground and surrounded by a rock cairn, which marks the U. S. C. & G. S. latitude station of 1901. This pipe is 3½ feet long and 3½ inches in diameter and is covered by a brass cap.

O


120°
85°
110°
TREASURY DEPARTMENT
LINES OF EQUAL MAGNETIC DECLINATION
ALASKA
1902
Scale 1/3700000
Published at Washington, D.C.
June, 1902.
BY THE U.S. COAST AND GEODETIC SURVEY
O. H. Tittmann, Superintendent
32°E.
30°E.
28°E.
26°E.
24°E.
22°E.
Juneau
Sitka
Port Simpson
Queen Charlotte Is.
Vancouver I
Victoria
Cape Flattery
Tacoma
Fraser River
Columbia River
50°
45°
140°
130° W. from Greenwich

AUG 1 1910

Astr 6279.02
United States magnetic declination
Cabot Science
003364759
3 2044 091 924 951